

A SYSTEMATIC REVISION OF *CAPPARIS* SECTION *CAPPARIS* (CAPPARACEAE)^{1, 2}

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ABSTRACT

A systematic revision of *Capparis* sect. *Capparis*, from western and Central Asia, North Africa, and Europe, is presented here. The taxonomy of this section has been approached combining morphological, biogeographical and molecular data when available. Ten species are recognized, including two new species, *Capparis atlantica* and *C. zoharyi*. In addition, four new subspecies are presented: *Capparis ovata* subsp. *myrtifolia*, *C. parviflora* subsp. *sphaerocarpa*, *C. sicula* subsp. *mesopotamica*, and *C. sicula* subsp. *sindiana*. Lectotypes are designated for *C. aegyptia*, *C. hereroensis*, *C. mucronifolia*, *C. elliptica*, *C. mucronifolia* Boiss. subsp. *rosanoriana*, *C. rupestris*, *C. ovata*, *C. parviflora*, *C. spinosa* var. *canescens*, *C. sicula* subsp. *herbacea*, and *C. sicula* subsp. *leucophylla*. A full taxonomic treatment, keys, and distribution maps of the recognized species are provided. The two new species are illustrated.

Key words: Capparaceae, *Capparis*, taxonomy.

Capparis (Καππαρίς) is a name coined by Theophrastus (4th century BC) and endorsed by Dioscorides (1st century AD). It seems to have come into wide use after the spread of the Arab culture in the Middle Ages. The Genus *Capparis* was created by Linnaeus (1753, 1754) with the description of *Capparis spinosa* L. and other *Capparis* species (Jarvis et al., 1993). *Capparis* comprises around 250 species distributed in tropical and subtropical zones of southern America, Europe, Africa, Madagascar, Asia, Australia, and the Pacific Islands (Willis, 1988).

TAXONOMIC HISTORY

Candolle (1824), who proposed a sectional division of the genus, provided the first comprehensive systematic approach to *Capparis*. Old World taxa belong to Section 1. *Capparis* (= *Eucapparis* DC.). Representative species: *C. spinosa* L. with four subsections. Subsection *Capparis* (= *Pedicellares* DC.). Flowers always solitary at leaf axils. In addition to *C. spinosa* and related species, other representatives include species such as *C. cartilaginea* Decne. Some species with geminate flowers or in bunches of three, rarely alone, such as *C. horrida* L. f., *C. pubiflora* DC., and *C. canescens* DC., were later

transferred to section *Monostichocalyx* Radlk. and section *Busbeckea* (Endl.) Benth. & Hook. Subsection *Seriales* DC. Racemose inflorescences or in series on the stems. Representative species: *C. zeylanica* L., *C. acuminata* Willd., *C. quadriflora* DC., *C. rotundifolia* Rottl., *C. brevispina* DC. Subsection *Corymbosae* DC. Corymbose inflorescences. Representative species: *C. sepiaria* L., *C. umbellata* Brown ex DC., *C. incanescens* DC. subsection *Octandrae* DC. Flowers with 8 stamens. Representative species: *C. racemulosa* DC., *C. oleoides* Burch., *C. coriacea* Burch.

New World taxa are included in five sections. Section 2. *Capparidastrum* DC. Stems generally thorny, oval sepals without gland, and short gynophore. Representative species: *C. brasiliensis* DC., *C. macrophylla* HBK, *C. cuneata* DC. Section 3. *Cynophalla* DC. Stems generally thorny, oval sepals possessing basal gland or foveola, and large gynophore. Representative species: *C. cynophallophora* L., *C. guayaquilensis* HBK, *C. amplissima* Lam. Section 4. *Calanthea* DC. Rounded fruit section, thin sepals, linear, and sharp. Representative species: *C. nemorosa* Jacq., *C. pulcherrima* Jacq. Section 5. *Breynias-trum* DC. Triangular sepals, sharp; always very short gynophore. Representative species: *C. ferruginea* L., *C. incana* HBK, *C. indica* (L.) Rawc. & Rendle.

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Section 6. *Quadrella* DC. Angular fruit section. Representative species: *C. jamaicensis* Jacq., *C. intermedia* HBK, *C. crotonoides* HBK. The species *C. decidua* (Forssk.) Edgew. with deciduous leaves, up to 20×3 mm in size, is included by Candolle (1824) in the genus *Sodada* Forssk.

This was followed in part by Benthams & Hooker (1862), although they created three new sections: section *Sodada* (Forssk.) Benth. & Hook. including *C. decidua*; section *Busbeckea* (Endl.) Benth. & Hook. including Australian species; and section *Beautemp-sia* (Gaud.) Benth. & Hook. including one American species.

Zohary (1960) proposed new systematics based on a partial geographical review of this genus restricted to the Mediterranean region and West Asia. He recognized two biogeographical groups: the tropical, including *Capparis decidua*, *C. cartilaginea*, *C. mucronifolia* Boiss., and the Mediterranean, including species that have lost their links with the tropical African stock (*C. spinosa*, *C. sicula* Veill., *C. leucophylla* DC.). All species belong to section *Capparis* in the sense of Candolle (1824).

Jacobs (1965) attended to the *Capparis* species from India to the Pacific, and organized them into four sections: 1. section *Capparis*, monotypic with *C. spinosa*, s.l.; 2. section *Sodada*, monotypic with *C. decidua*; 3. section *Monostichocalyx* Radlk., in a new circumscription containing most of the species formerly included in section *Capparis* (= *Eucapparis* DC.), with about 65 species in the area under revision; 4. section *Busbeckea*, with 14 species in all.

Higton and Akeroyd (1991) reviewed the diversity of *Capparis* in the Mediterranean region, especially in connection with *C. spinosa*, examining six species in one section, which were finally reduced to a single species with two subspecies.

Hall et al. (2002) analyzed sequence variation for a large sampling of Brassicaceae and Capparaceae, using two chloroplast regions, *trnL-trnF* and *ndhF*. The results of parsimony and likelihood analyses strongly supported the monophyly of Brassicaceae plus Capparaceae and recognized three clades: Capparaceae subfamily Capparoideae, subfamily Cleomoideae, and Brassicaceae. Habit and fruit characteristics demarcate these three clades. All Capparoideae are woody, which is the plesiomorphic condition for the Brassicaceae and Capparaceae clades. The herbaceous habit is generally found in Cleomoideae and Brassicaceae. Indehiscent, fleshy fruits are plesiomorphic in Capparaceae and Brassicaceae and are the dominant fruit type of Capparoideae. Brassicaceae and Cleomoideae both have dehiscent capsules with a replum, a synapomorphy shared by these two clades. The dehiscent fruits of

Capparoideae are almost always fleshy in nature in contrast to the often dry fruits of Cleomoideae and Brassicaceae. Floral symmetry, stamen number, leaf type, and fruit type all show homoplasy. Clades within Capparoideae show a biogeographical pattern based on this sampling with a New World clade (all New World representatives of *Capparis*, *Belencita* Karst., *Morisonia* L., *Boscia* Lam., and *Cadaba* Forssk.) and an Old World clade (*Maerua* Forssk., *Tylachium* Lour., *Ritchiea* R. Br., and *Cadaba*). The Old World species *Capparis tomentosa* Lam. is nested within an otherwise New World clade (based only on *trnL-trnF*). Old World *Capparis spinosa*, the type of genus *Capparis*, is nested within an Australasian clade, with *Apophyllum anomalum* F. Muell. (western New South Wales) and *Capparis callophylla* Blume (Java) (based only on *trnL-trnF*).

DNA sequencing of the chloroplast *rcbL* gene nested New World *Capparis hastata* Jacq. and Old World *C. sandwichiana* DC. in the same clade, but sampling was restricted to these two *Capparis* species and comparison was made with *Crataeva* L. species (Rodman et al., 1998; Cummings et al., 2003).

Taxonomic confusion of *Capparis* sect. *Capparis* is reflected in the number of combinations and changes of rank, with frequent placement under *C. spinosa* (Zohary, 1960; Jacobs, 1965; Higton & Akeroyd, 1991). *Capparis spinosa* has become a blanket identification used to cover the scarce level of definition of the taxa in *Capparis* sect. *Capparis* (Greuter et al., 1984). This has both taxonomic and economic implications, as *Capparis* flower buds are the crude material used as commercial capers and variability in this economic product is determined mostly by taxonomic differences (Inocencio, 2001; Inocencio et al., 2002). Molecular studies of *Capparis* sect. *Capparis* have been scarce or restricted to small sampling (Fici, 2001).

A genetic fingerprinting technique (AFLP) was used by Inocencio et al. (2005) to examine the relationships among *Capparis* species. Genetic distances, based on AFLP data, were estimated for 45 accessions of *Capparis* species from Spain, Morocco, and Syria. The results of this analysis support the differentiation of four (*C. orientalis* Veill., *C. sicula*, *C. aegyptia* Lam., and *C. ovata* Desf.) of the five taxa sampled. The fifth, excluded, species was *C. spinosa*. The group of plants recognized as *C. spinosa* on the basis of morphological characters such as shrub procumbent or somewhat erect, stipules usually weak or vestigial, rarely strong, very long and thin (0.3–0.6 cm long), indument on leaves always very lax, and trichomes thick and long (300–500 μ m long), is found almost exclusively in cultivation. Several cultivars of *C. spinosa* appear in an intermediate position between

C. orientalis and *C. sicula* and overlap with *C. orientalis*. The other two species, *C. aegyptia* and *C. ovata*, are morphologically distinct, characterized by their habit, stipules, and leaves (*C. aegyptia*: shrubs somewhat erect; twigs gray-green or blue-green with waxy cover; stipules curved, retrorse; leaves obovate to ovate, bases and apices rounded, $2\text{--}3 \times 1.8\text{--}3$ cm; *C. ovata*: shrub pendulous; adult leaves ovate, texture subcoriaceous; stipules curved, mostly antrorse).

The objective of the present revision is to provide a general taxonomy, based fundamentally on morphological data for *Capparis* sect. *Capparis*.

TAXONOMIC CONTEXT OF *CAPPARIS* SECT. *CAPPARIS*

Capparis belongs to the subfamily Capparoideae (Capparaceae), that also includes *Cadaba*, *Crataeva*, *Morisonia*, *Boscia*, and other New World and Old World genera (Hall et al., 2002). The different genera overlap in molecular studies (Hall et al., 2002), although a marked biogeographical distinction is found between New World and Old World groups, recognized at the level of section or subsection (Candolle, 1824; Bentham & Hooker, 1862; Hall et al., 2002). A tentative infrageneric division is presented in Table 1 in order to contextualize *Capparis* sect. *Capparis*. There are many unresolved taxonomic and nomenclatural issues for infrastructure in *Capparis*. Therefore taxa in Table 1 are merely presented as a synthesis of major groups.

GEOGRAPHIC DISTRIBUTION AND ENDEMISM

Capparis is mostly a Pantropical genus, but section *Capparis* is almost strictly Holarctic with six exclusive species (*C. aegyptia*, *C. atlantica* Inocencio, D. Rivera, Obón & Alcaraz, sp. nov., *C. orientalis*, *C. ovata*, *C. spinosa*, *C. zoharyi* Inocencio, D. Rivera, Obón & Alcaraz, sp. nov.), one paleotropical species (*C. hereroensis* Schinz), and three in holarctic and paleotropical areas (*C. mucronifolia*, *C. parviflora* Boiss., *C. sicula*). Here we name the floristic categories (kingdoms and regions) according to Takhtajan (1986). *Capparis* sect. *Capparis* has its maximum diversity in the Mediterranean Region (Holarctic) with seven species (*C. aegyptia*, *C. atlantica*, *C. orientalis*, *C. ovata*, *C. spinosa*, *C. zoharyi*, *C. sicula*). It is followed next by the Saharo-Arabian Region (also Holarctic) with six species in North Africa and the Arabian Peninsula (*C. aegyptia*, *C. ovata*, *C. zoharyi*, *C. mucronifolia*, *C. parviflora*, *C. sicula*). The Irano-Turanian Region (Holarctic) is inhabited by four species extending along most of West and Central Asia (*C. aegyptia*, *C. mucronifolia*,

C. parviflora, *C. sicula*). The Sudano-Zambezian Region (Paleotropical) is inhabited by three species in tropical East Africa, littoral Arabia, western India, and southern Pakistan (*C. mucronifolia*, *C. parviflora*, *C. sicula*). The African Karoo-Namib and Indian regions are inhabited by one single species each (*C. hereroensis* and *C. sicula*, respectively). *Capparis sicula* is the most widespread species, stretching from the Western Mediterranean to the Himalayan Mountains and the Rajasthan of India (Indian Region, Paleotropical). *Capparis hereroensis*, in western Namibia, is the only species confined to the African Karoo-Namib Region (sensu Takhtajan, 1986). Endemic taxa are infrequent in this section, although *C. atlantica* is endemic to the Atlas range in Morocco, *C. mucronifolia* Boiss. subsp. *rosanoviana* (B. Fedtsch.) Inocencio, D. Rivera, Obón & Alcaraz is endemic to central Tajikistan, and *C. parviflora* Boiss. subsp. *sphaerocarpa* Inocencio, D. Rivera, Obón & Alcaraz is endemic to the western provinces (Nimruz, Farah, Herat) in Afghanistan.

ECONOMIC IMPORTANCE

Species of *Capparis* sect. *Capparis* are widely used as food and medicine in the Old World. *Capparis spinosa* is almost exclusively known in cultivation. The supposed wild individuals of *C. spinosa* are often remnants of ancient caper fields or escaped from cultivation. Local caper cultivars and ethnovarieties are recognized throughout the Western and central Mediterranean region (Spain, France, Italy, continental and insular). These principally belong to *C. spinosa*, but also to *C. orientalis* (Rivera et al., 1999, 2003b). Flower buds, consumed as brined product, are a rich source of the antioxidant phenolic compound rutin (Inocencio et al., 2000). The use of *Capparis* species by humans has been traced to the Prehistory and early historic times of Western Europe (1st–2nd cent. A.D., Tongeren, Belgium), the Mediterranean region (9000–7400 B.C., Franchti Cave, Greece), and West Asia (9th–8th mill. B.C., Tell Mureybit, Syria), as evidenced by the presence of these species in archaeological sites (Rivera et al., 2002).

MATERIAL AND METHODS

The herbaria and libraries of the following institutions were consulted: BM, E, JEPS, K, MA, MUB, OXF, P, RSA, and UMH. Specimens on loan were received from BISH, BR C, G, HUB, HUJ, MARSSJ, RNG, and US. Special collection trips were conducted in North Africa, western Asia, and Mediterranean Spain to obtain fresh material for molecular studies, for the in vivo study of floral characters, and for

Table 1. Tentative infrageneric division of *Capparis* presented in order to contextualize *Capparis* section *Capparis*.

Infrageneric rank	Characters	Representative species	Distribution
Sect. <i>Breyniastrum</i> (Plum.) DC.	Branches unarmed. Leaves large (more than 0.3 cm wide) and persistent. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Sepals triangular, sharp; gynophore always very short. Flowers with numerous stamens (> 50). Fruit rounded in cross section.	<i>C. ferruginea</i> L., <i>C. incana</i> HBK, <i>C. indica</i> (L.) Rawc. & Rendle.	New World
Sect. <i>Calanthea</i> DC.	Leaves large (more than 0.3 cm wide) and persistent. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Sepals thin, linear, and pointed. Flowers with numerous stamens (> 50). Fruit rounded in cross section.	<i>C. nemorosa</i> Jacq., <i>C. pulcherrima</i> Jacq.	New World
Sect. <i>Capparidastrum</i> DC.	Stems generally thorny. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Leaves large (more than 0.3 cm wide) and persistent. Sepals oval without gland. Flowers with numerous stamens (> 50). Gynophore short. Fruit rounded in cross section.	<i>C. brasiliana</i> DC., <i>C. macrophylla</i> HBK, <i>C. cuneata</i> DC.	New World
Sect. <i>Capparis</i>	Flowers always solitary at leaf axils. Plants with flowers slightly zygomorphic, abaxial sepal not galeate or slightly galeate. Flowers with numerous stamens (> 50).	<i>C. spinosa</i> L.	Old World
Sect. <i>Corymbosae</i> (DC.) Span. (= Subsect. <i>Corymbosae</i> DC., Sect. <i>Monostichocalyx</i> Radlk, p.p.)	Branches unarmed. Leaves large (more than 0.3 cm wide) and persistent. Flowers in corymbose inflorescences. Sepals rounded; gynophore very short or large. Flowers with numerous stamens (> 50). Fruit rounded in cross section.	<i>C. sepiaria</i> L., <i>C. umbellata</i> Brown ex DC., <i>C. incanescens</i> DC.	Old World
Sect. <i>Cynophalla</i> DC.	Stems generally thorny. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Leaves large (more than 0.3 cm wide) and persistent. Sepals ovate possessing basal gland or foveole. Flowers with numerous stamens (> 50). Gynophore large. Fruit rounded in cross section.	<i>C. cynophallophora</i> L., <i>C. guayaquilensis</i> HBK, <i>C. amplissima</i> Lam.	New World

Table 1. Continued.

Infrageneric rank	Characters	Representative species	Distribution
Sect. <i>Galeatae</i> Inocencio et al.	Flowers always solitary at leaf axils. Plants with flowers strongly zygomorphic, abaxial sepal strongly galeate. Flowers with numerous stamens (> 50).	<i>C. cartilaginea</i> Decne.	Old World
Sect. <i>Quadrella</i> DC.	Leaves large (more than 0.3 cm wide) and persistent. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Flowers with numerous stamens (> 50). Fruit angular in cross section.	<i>C. jamaicensis</i> Jacq., <i>C. intermedia</i> HBK, <i>C. crotonoides</i> HBK	New World
Sect. <i>Seriales</i> (DC.) Span. (= Subsect. <i>Seriales</i> DC., Sect. <i>Monostichocalyx</i> Radlk. p.p.)	Branches unarmed. Leaves large (more than 0.3 cm wide) and persistent. Inflorescences racemose or in series on the stems. Sepals rounded. Flowers with numerous stamens (> 50). Gynophore very short or large. Fruit rounded in cross section.	<i>C. zeylanica</i> L. <i>C. acuminata</i> Willd., <i>C. quadriflora</i> DC., <i>C. rotundifolia</i> Rottl., <i>C. brevispina</i> DC.	Old World
Sect. <i>Sodada</i> (Forssk.) Benth. & Hook.	Leaves thin, $0.3\text{--}2.0 \times 0.1\text{--}0.3$ cm, deciduous. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Flowers with numerous stamens (8–18).	<i>C. decidua</i> (Forssk.) Edgew.	Old World
Subsect. <i>Octandrae</i> DC.	Branches unarmed. Leaves large (more than 0.3 cm wide) and persistent. Flowers in simple or compound inflorescences (racemes, umbels, corymbs), although solitary flowers at the leaf axil may appear in some individuals. Sepals rounded. Flowers with 8 stamens. Gynophore very short or large. Fruit rounded in cross section.	<i>C. racemulosa</i> DC., <i>C. oleoides</i> Burch., <i>C. coriacea</i> Burch.	Old World
Subsect. <i>Pedicellares</i> DC. (= Sect. <i>Monostichocalyx</i> Radlk. p.p., Sect. <i>Busbeckia</i> (Endl.) Benth. & Hook. p.p.)	Branches unarmed. Flowers geminate or in bunches of three, rarely alone. Leaves large (more than 0.3 cm wide) and persistent. Sepals rounded. Flowers with numerous stamens (> 50). Gynophore very short or large. Fruit rounded in cross section.	<i>C. horrida</i> L. f., <i>C. pubiflora</i> DC., <i>C. canescens</i> DC.	Old World

Table 2. List of morphological characters considered in the study.

Character	States
1. Plant habit	Erect / procumbent / pendulous
2. Height	Maximum length of the stems in meters
3. Twig shape	Tortuose / straight
4. Twig color	Green / yellowish / reddish / waxy
5. Internodes	Length in millimeters
6. Stipule shape	Curved / somewhat curved / straight / setaceous
7. Stipule orientation	Spreading / retrorse / antrorse
8. Stipule base	Decurrent / not decurrent
9. Stipule color	Orange-yellow / orange / golden-yellow
10. Leaf shape	Rounded / ovate / lanceolate / oblong / elliptical / obcordate /obovate
11. Base of the leaf	Obtuse/ tapering / acute/ cordate
12. Leaf apex	Acute / rounded / obcordate / obtuse / truncate
13. Mucro presence and length	Long (1–1.5 mm) / small (0.5–1 mm) / very small (0.1–0.5 mm) / lacking
14. Mucro shape	Straight / curved
15. Leaf texture	Herbaceous / fleshy
16. Leaf veins prominence	Prominent / not prominent
17. Petiole length	Very short (less than 0.5 cm) / short (0.5–1.5 cm) / long (exceeding 1.5 cm)
18. Leaf abaxial indument	Very dense / dense / dense to lax / lax / very lax
19. Trichome thickness	Thick (25–50 µm) / thin (15–25 µm)
20. Trichome length	Long (250–900 µm) / short (50–250 µm)
21. Fertile floral pedicel length	Long (greater than 4 cm) / short (1.5–4 cm)
22. Fertile floral pedicel thickness	Thick (over 1 mm) / slender (less than or equal to 1 mm)
23. Flower bud apex	Acute / rounded
24. Abaxial sepal	Galeate / slightly galeate
25. Flower symmetry	Zygomorphic / somewhat zygomorphic
26. Number of stamens	Numerous (100–150) / not so numerous (40–80)
27. Anther length	Very small (2 mm) / small (2–3 mm) / large (3 mm)
28. Anther apex	Rounded / acute
29. Fruit shape	Rounded / ellipsoidal / obovate / oblong
30. Pulp color	Red / yellow
31. Seed color	Brown/ dark brown
32. Seed size	Length × width × depth in millimeters

preparing exsiccatae. Voucher specimens were deposited in MUB and UMH.

Here we base species on morphological and biogeographical features. The species represented are more or less distinct, heterogeneous, and variable morpho-physiological entities, the origin of which is associated with a particular environment and area in agreement with Vavilov (1931). Taxa are defined in such a way that it is relatively easy to determine the ascription of each specimen to either one or another. Therefore, extremely large and variable species were avoided. Discontinuities, both geographical and morphological (see vestiture, stipules, leaves, inflorescences, flowers, and fruits sections in this paper), are good markers, but hybridization and hybrid swarms have obscured the definition of species and subspecies.

New taxa are represented in Figures 3, 6–9.

Geographic distributions have been plotted exclusively using the information from herbarium sheets.

Distribution of species comprising several subspecies is represented in Figures 2, 4, and 5. Habitat is described using the available data on herbarium labels and those reported in the protologue of each taxa. Phenology data are restricted to the flowering-fruiting period according to the herbarium specimen labels and the protologue.

TAXONOMIC CHARACTERS IN *CAPPARIS* SECT. *CAPPARIS*

We have shown that molecular, phytochemical, and in vivo data are useful for understanding patterns of variation and, as such, were considered for the populations present in Spain, Morocco, Syria, and Lebanon (Inocencio, 2001; Inocencio et al., 2000, 2002, 2005); however, these methods have not yet been applied to the entire section. Therefore, we selected characters generally available in herbarium specimens (Table 2), some of which have been used for the first time in this study. For example, anther tip



Figure 1. Plant habit: —A. Erect, e.g., *Capparis zoharyi*. Drawn from photo taken in Llano del Beal, Murcia, Spain. —B. Procumbent, e.g., *C. spinosa*. Drawn from photo taken in Llubí, Mallorca, Spain. —C. Pendulous, e.g., *C. orientalis*. Drawn from photo taken in Palma de Mallorca, Spain.

shape was recognized as a useful character for identifying living, herbarium, and processed material (Inocencio et al., 2002); once characterized in fresh material, it is relatively easy to determine in herbarium specimens by re-hydrating the anthers and using a stereomicroscope. All the selected characters were studied in mature specimens with open flowers and ripe fruit. The quantitative characters are expressed using SI metric units.

PLANT HABIT IN *CAPPARIS* SECT. *CAPPARIS*

Capparis comprises small trees, shrubs, or geophytes. All species of section *Capparis* are erect, procumbent, or pendulous shrubs (Fig. 1). Some (*C. sicula*) behave as a true geophyte, with underground, branched perennial stems and decaying annual aerial parts (géothamne, sensu Bocquet & Aeschiman, 1981).

VESTITURE IN *CAPPARIS* SECT. *CAPPARIS*

Plants glabrous or with simple trichomes as the indument. Trichome types and the density of pubescence on various parts of the plant are useful characters for identifying some *Capparis* species. However, high infraspecific variation is common in collections identified as *C. sicula*, for example. More consistent vestiture is found on the abaxial part of the leaves, where density, thickness, and length of the indument (Table 1) may be analyzed for each taxon.

STIPULES AND LEAVES IN *CAPPARIS* SECT. *CAPPARIS*

Spiny stipules developing at the base of the petioles are absent in some species (e.g., *Capparis orientalis*) or are early shedding (e.g., *C. hereroensis*, *C. ovata*, *C. spinosa*). Stipule shape, color, direction of curvature and decurrence at the base are distinctive characters (Table 1).

Leaves are simple, not divided, alternate, with petioles well differentiated. Leaf morphology furnishes distinctive characters (shape, texture, base type, apex type, presence and type of mucro) (Table 2). The size and, much less, the shape of the leaves are variable within many species. Leaf size especially depends on water availability and exposure to winds and sun during the growing season. Petiole length, although variable within species, can be sorted into three groups (Table 2).

INFLORESCENCES AND FLOWERS IN *CAPPARIS* SECT. *CAPPARIS*

The flowers are solitary in the axil of the leaves. This is a distinctive character for the section. In other sections (except sect. *Galeatae*) the flowers form

corymbose or racemose inflorescences. Flower buds may have acute or rounded apices. Flowers are bisexual and more or less zygomorphic. Four green sepals are always present, free, concave, having a more or less galeate (helmet-shaped) abaxial sepal. Four white or pink petals are always present, free, oval, frequently unequal. From 50 to numerous stamens. Anthers are small to large (Table 2) with a rounded or sharp apex; androphore absent. Nectary situated in the floral disk, between the insertion of the petals and sepals, triangular in form, apex directed toward the flower's interior. Nectary morphology can be a highly valuable taxonomic resource, but only available in fresh or well-preserved material (Inocencio et al., 2002). A gynophore is present, usually exceeding the stamens in length. The ovary is ellipsoid, situated at the end of the gynophore, unilocular, with (2 to)4(to 10) placentas.

FRUITS IN *CAPPARIS* SECT. *CAPPARIS*

The fruit is an oblong, ovoid, ellipsoid, or globose berry, that is green in color with well-defined longitudinal nerves, along which dehiscence later occurs. Seeds are from one to numerous, and are generally brown in color when mature, immersed in a reddish or yellow pulp. Seed shape, color, and dimensions have been noted to be of limited taxonomic value (Rivera et al., 2002).

TAXONOMIC TREATMENT

***Capparis* L., Sp. pl.: 503. 1753. TYPE: *Capparis spinosa* L.**

Beautempsia Gaudich., Voyage Bonite Bot. Atlas: tab. 56. 1842 [1844–46]. TYPE: *Beautempsia avicenniaefolia* Gaudich., Voyage Bonite Bot. Atlas: tab. 56. 1842 [1844–46].

Busbeckea Endl., Prodr. Fl. Ins. Norf. 64. 1833. TYPE: *Busbeckea nobilis* Endl., Prodr. Fl. Ins. Norf. 64. 1833.
Colicodendron Mart., Flora 22(1) (Beibl.): 25. 1839. TYPE: *Colicodendron yco* Mart., Flora 22 (1) (Beibl.): 25. 1839.

Destrugesia Gaudich., Voyage Bonite Bot. Atlas: tab. 57. 1842 [1844–1846]. TYPE: *Destrugesia scabrida* Gaudich., Voyage Bonite Bot. Atlas: tab. 57. 1842 [1844–1846].

Hombak Adans., Fam. 2: 402, 408. 1763. TYPE: Genus described referring to Lippi MS. (Manuscript list of plants collected in Egypt by Lippi.) There are no species associated with the genus in the protologue. However, the inflorescence type, lack of leaves, and origin (Lippi, hence Egypt) likely refer to *Sodada decudua* Forssk. (= *Capparis aphylla* Roth).

Oligloron Raf., Sylva Telluriana: 109. 1838. TYPE: *Oligloron zeylanica* Raf.

Olofuton Raf., Sylva Telluriana: 108. 1838. TYPE: *Olofuton racemosum* Raf.

Pseudocroton Müll. Arg. Flora 55: 24. 1872. TYPE: *Pseudocroton tinctorius* Müll.
Quadrella (DC.) J. S. Presl, in Berchtold & J. S. Presl., Prirozenosti Rostlin 2: 260. 1825. TYPE: *Quadrella crotonoides* (Kunth) J. S. Presl. (= *Capparis crotonoides* Kunth, Nov. Gen. Sp. 5: 95. 1821).
Sodada Forssk., Fl. Aegypt.-Arab: 81. 1775. TYPE: *Sodada decidua* Forssk.
Utrerveria Bertoloni, Pl. Nov. Hort. Bonon. 2: 8. 1839. TYPE: *Utrerveria frondosa* Bertol.

Capparis section **Capparis** TYPE: *Capparis spinosa* L.

A total of 10 species and 12 subspecies of economic relevance are recognized, distributed in the tropical, subtropical, and Mediterranean zones of both hemispheres. Widely represented in Asia, and reaching southern Europe, eastern, northern, and southwestern Africa. A key for the species and recognized nothospecies of *Capparis* sect. *Capparis* is presented here.

KEY TO THE SPECIES OF *CAPPARIS* SECT. *CAPPARIS* IN ASIA, EUROPE, AND AFRICA

- 1a. Plants unarmed, or with stipules vestigial or caducous. Mediterranean Europe and North Africa [Albania, Algeria, Croatia, Greece, Italy, Libya, Malta, Spain, Turkey] 5. *C. orientalis*
- 1b. Plants always spiny 2
- 2a. Stipules retrorse to horizontally oriented 3
- 3a. Leaf texture somewhat fleshy 4
- 4a. Twigs yellow or gray-green, not glaucous, without waxy bloom; stipules golden yellow, not decurrent. Middle East [Afghanistan, Iran, Oman, Tajikistan, United Arab Emirates]. 1. *C. mucronifolia*
- 4b. Twigs green to red-purple, or glaucous due to a waxy covering; stipules orange, decurrent 5
- 5a. Shrubs erect; stipules strongly decurrent. Mediterranean Europe, North Africa, Middle East into Turkey [Algeria, Egypt, Greece, Israel, Jordan, Lebanon, Morocco, Spain, Syria, Turkey]. 10. *C. zoharyi*
- 5b. Shrub procumbent, or somewhat erect or pendulous; stipules decurrent to not decurrent 6
- 6a. Shrub pendulous; leaves lanceolate to ovate-lanceolate. North Africa [Algeria, Chad, Libya, Morocco, Tunisia] 6. *C. ovata*
- 6b. Shrub procumbent or somewhat erect; leaves rounded or obovate to ovate 7
- 7a. Shrub procumbent; twigs purple-red; without waxy bloom; leaves rounded, tip acute, base rounded to cordate. North Africa [Morocco] 2. *C. atlantica*
- 7b. Shrubs somewhat erect; twigs gray-green or glaucous, with waxy bloom; leaves obovate to ovate, bases and apices rounded. North Africa, Middle East into India [Egypt, India, Israel, Jordan, Saudi Arabia] 1. *C. aegyptia*
- 3b. Leaf texture herbaceous 8
- 8a. Flowers zygomorphic; abaxial sepal helmet-shaped, 1.7–2.5 cm long, 0.7–1.2 cm deep 9
- 9a. Shrub procumbent; stipules usually stout; pubescence on leaves from lax to very dense (rarely

- very lax). Mediterranean Europe, North Africa, Middle East into India [Afghanistan, Albania, Algeria, Azerbaijan, Cyprus, Georgia, Greece, India, Iran, Iraq, Israel, Italy, Jordan, Kazakhstan, Mongolia, Morocco, Pakistan, Saudi Arabia, Spain, Syria, Turkey, Turkmenistan, Ukraine, Uzbekistan, Yemen] 8. *C. sicula*
- 9b. Shrub procumbent or somewhat erect; stipules usually weak or vestigial, rarely stout; indument on leaves always very lax. Mediterranean Europe, Middle East into Turkey [France, Greece, Italy, Spain, Turkey] 9. *C. spinosa*
- 8b. Flowers slightly zygomorphic; abaxial sepal slightly galeate only to 1.4 cm long, to 0.6 cm deep. Middle East [Afghanistan, Iran, Iraq, Pakistan, Saudi Arabia, Turkmenistan] 7. *C. parviflora*
- 2b. Stipules mostly antrorse in orientation 10
- 10a. Shrub pendulous; mature leaves ovate; texture subcoriaceous; stipules curved. North Africa [Algeria, Chad, Libya, Morocco, Tunisia]. 6. *C. ovata*
- 10b. Shrub erect; mature leaves oblong to obovate; texture somewhat coriaceous; stipules setaceous. South Africa [Namibia] 3. *C. hereroensis*

1. *Capparis aegyptia* Lam., Encycl. Method. Bot. 1: 605. 1783. *Capparis spinosa* var. *aegyptia* (Lam.) Boiss., Fl. orient. 1: 420. 1867. TYPE: [Egypt] “Lipi á observé ce Caprier en Egypte (v.s. in herb Isn.)” (lectotype, designated here, P-JU!; specimen on sheet 11,248 right).

Capparis sinaica Veill., in Duhamel, Traité Arbr. Arbust. Ed. 2, Vol. I: 144. 1801. TYPE: [Egypt] “Habite. L’Arabie pétrée, sur le Mont Sinai et les montagnes qui l’environnent, auprès du village du Pharagou, et sur les chemins entre le Mont Sinai et le château ou la ville de Tor, situés sur la mer Rouge, où il a été observé par Belón, Rauwolf et Shaw” (lectotype, t. 112 in Shaw, Cat. Pl. Variis Afr. 1738!, designated by Rivera et al. 2003a: 308–309).

Capparis deserti (Zohary) Täckh. & Boulos, Publ. Cairo Univer. Herb., 5: 14. 1972 [1974]. *Capparis spinosa* L. var. *deserti* Zohary, Bull. Res. Coun. Israel 8D: 56. 1960. TYPE: [Israel] Wadi Nosz, entrance to Wadi Lehiani (Bir Derheba), 27 Mar. 1944, P. H. Davis & N. Feinbrun 5076–7 (holotype, HU J!).

Shrub somewhat erect, glabrous; twigs straight, up to 3 m long, gray or blue green due to waxy cover that appears over the entire plant; internodes 1.5–4 cm; stipules curved, retrorse, slightly decurrent, orange, 0.3–0.4 cm long, 0.1–0.2 cm wide at the base. Leaves obovate to ovate, 2–3 × 1.8–3 cm, somewhat fleshy; leaf veins not prominent; bases and apices rounded; mucro very small, 0.1–0.5 mm, straight or curved; petioles 0.5–1 cm. Flower buds rounded; floral pedicels stout, 2.5–4 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate at apex, 1.4–1.6 cm long, 0.6–0.8 cm deep; stamens 30 to 80, anthers 1.2–1.5 mm, with rounded apices. Fruit

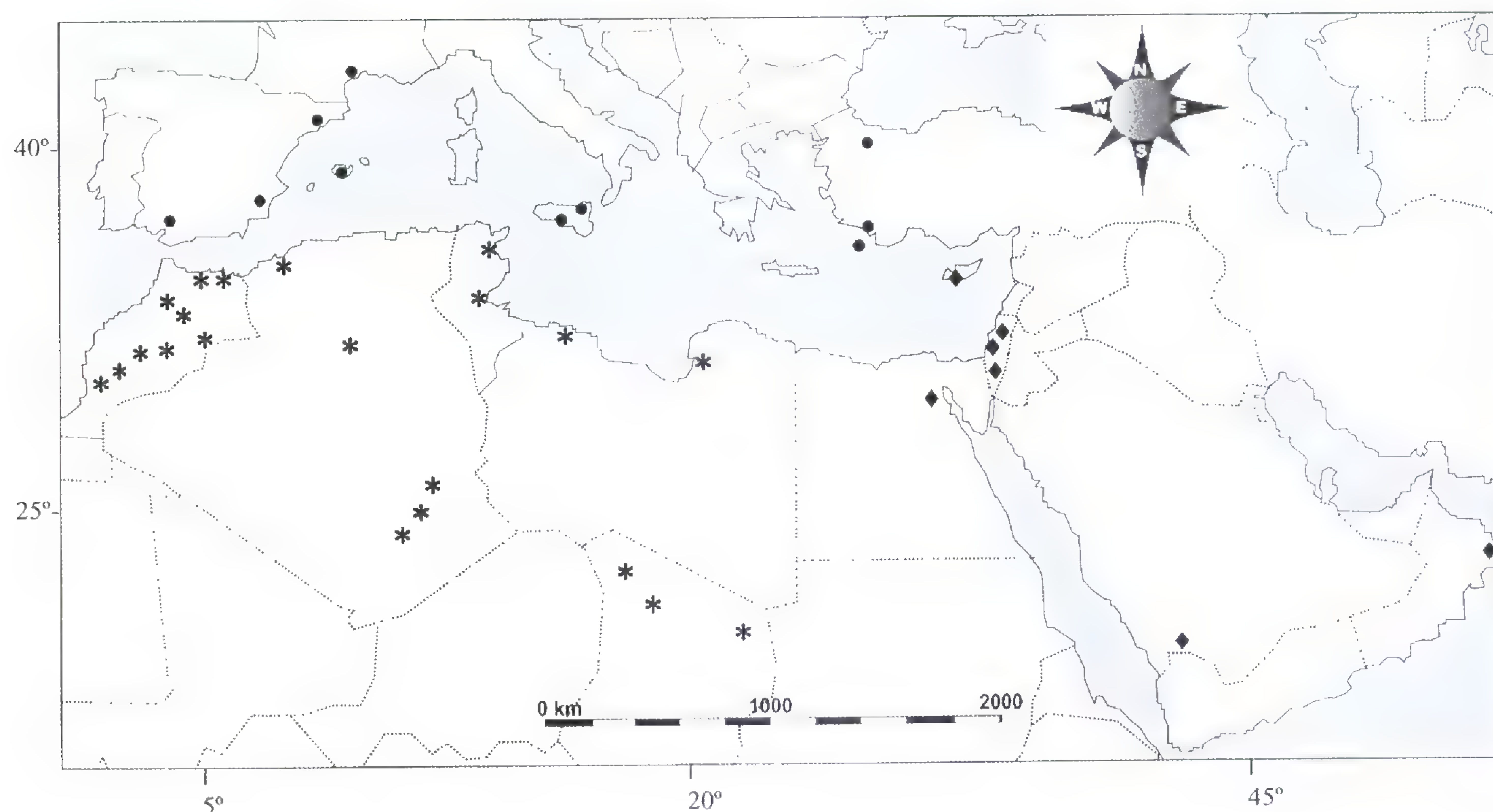


Figure 2. Distribution map for *Capparis ovata* (*) (both subspecies); *Capparis spinosa* (●); and *Capparis aegyptia* (◆). *Capparis aegyptia* also occurs in India, beyond map range.

oblong, pulp color unknown; ripe seeds dark brown, $3.2\text{--}3.4 \times 2.8\text{--}3 \times 1.8\text{--}2$ mm.

Illustrations. Plate 31(3) in Delile, 1812. Zohary (1960: 52, fig. 1). Täckholm. (1974: 163, pl. 48c). Migahid (1988: 48, pl. 26).

Phenology. Flowering and fruiting from (January) March to August (December).

Distribution and habitat. Saharo-Arabian, extending into the Irano-Turanian and Mediterranean Regions. North Africa, Middle East into India [Egypt, India, Israel, Jordan, Saudi Arabia]. Rocky places, steep slopes, at elevations from 0 to 2000 m, often in the vicinity of human dwellings. It is the common caper in Egypt and is often associated with the *Hyparrhenia hirta* (L.) Stapf community. Figure 2.

The type specimen of *Capparis aegyptia* has one flower, no fruits. It is part of the herbarium A. T. Danty d'Isnard, which is cited by Lamarck (1783): “v(idit) s(iccum) in herb(ario) Isn(ard).” It was included in 1857 in the Jussieu herbarium (P-JU). The specimen was collected “en face de Minia” in Egypt by one botanist who gave it to Isnard: “Doni per tu” [Gift for you]. It was, presumably, D. Lippi (1678–1704) himself. Isnard wrote the manuscript list of plants—now at P-JU—collected by Lippi in Egypt during his last trip in 1704 (Pritzel, 1872).

The basionym of *Capparis deserti* (Zohary) Täckh. & Boulos, *Capparis spinosa* L. var. *deserti* Zohary, was validly published by Zohary. However he states “This is a ‘weak’ variety because small-leaved forms occur almost in all groups.”

Selected specimens examined. EGYPT. Cairo, Schweinfurth 995 (K); Gebel Ez Zebir, Sinai, Tadmor S-417 (K); Minia, Lippi ? (P); Tadmor & Shmida S-420 (E); Sinai, Bové 273 (K). INDIA. Mahableshwar, Bombay, T. C. s.n. (E). ISRAEL. Nabulus, Stait 266 (RNG); Wadi Qelt, Davis 4888 (K); Ein Gedi, Lyschede s.n. (C); Kfar Gileh and Manara, Curle 65 (K); Manara, Curle 143 (E); Mount Gilboa, Davis 1667 (E); Wadi Yarmuk, Davis 4604 (E). JORDAN. Wadi Mujib, Ma'daba, Boulos 5856 (K). SAUDI ARABIA. Wadi Lakus, Jebel, Collenette 7228 (K).

2. *Capparis atlantica* Inocencio, D. Rivera, Obón & Alcaraz, sp. nov. TYPE: [Morocco] “Safi, 20–6-1999. Inocencio 60026” (holotype, UMH!; isotypes, MO!, K!, E!, MA!). Figure 3.

Suffrutex decumbens, usque ad 60 cm, caulibus purpureis, foliis rotundis, apice acutis, base rotundatis, 1.5–3 cm longis, 1.2–2.5 cm latis, a *C. zoharyi* differt; stipulis tenuioribus, apicibus foliorum acutis nunquam rotundis nec cordatis a *C. zoharyi* et *C. aegyptia* differt.

Shrub procumbent, up to 60 cm high, glabrous; twigs straight, up to 2 m long, reddish purple, sometimes green; internodes 1–3 cm; stipules curved, retrorse, slightly decurrent, orange, 0.3–0.6 cm long, 0.2–0.3 cm wide at the base. Leaves rounded, 1.5–3 × 1.2–2.5 cm, somewhat fleshy; leaf veins not prominent; bases rounded to cordate, apices acute; mucro very small, 0.1–0.5 mm, straight; petioles short, 0.3–1 cm. Flower buds rounded; floral pedicels slender, short, 2–3 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.4–1.6 cm long, 0.5–0.6 cm deep; stamens 30 to 80, anthers very small, 1.8–2 mm, apices rounded. Fruit oblong, pulp

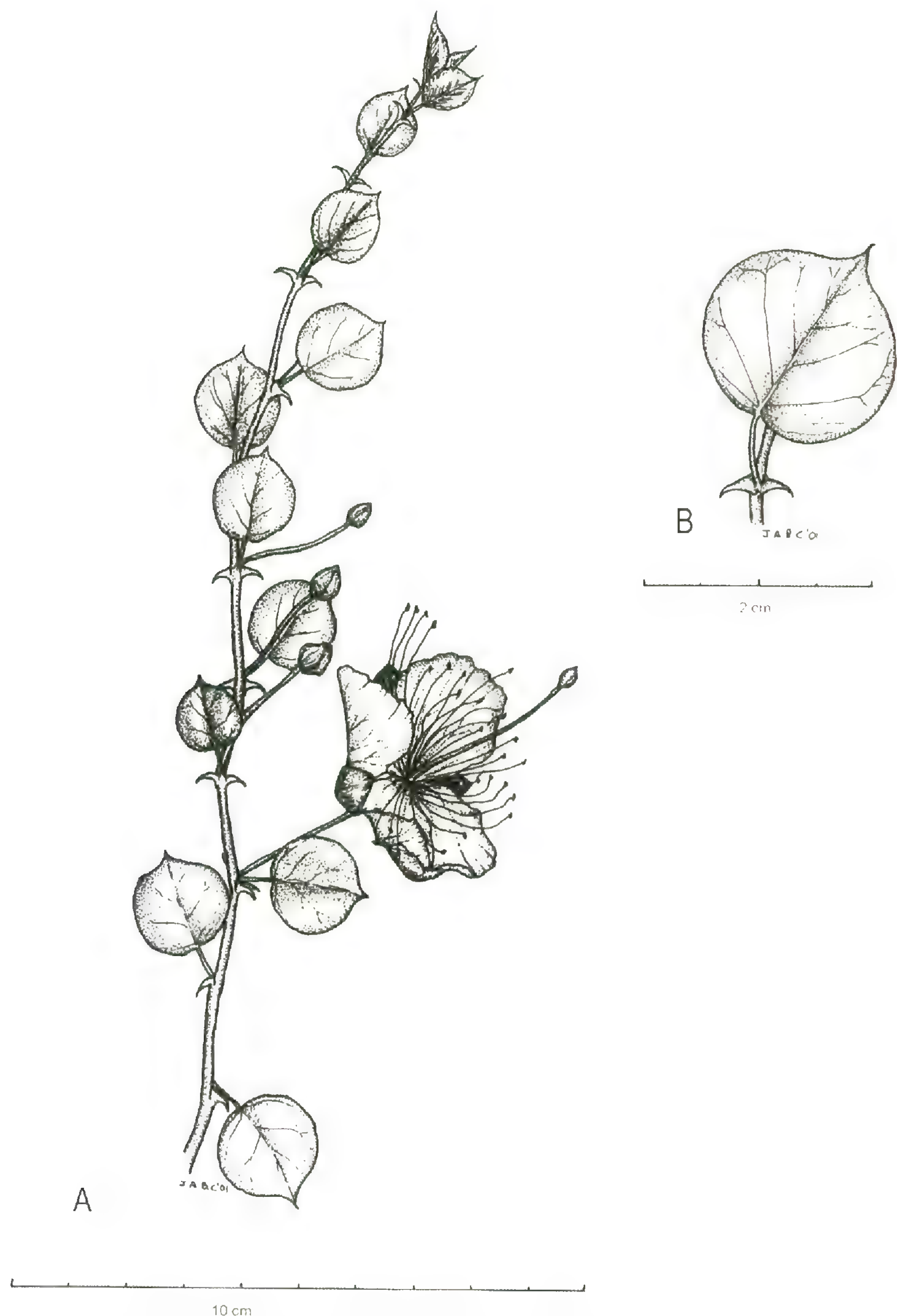


Figure 3. Details of the new species *Capparis atlantica* Inocencio, D. Rivera, Obón & F. Alcaraz. —A. Stem and flower. —B. Detail of leaf. (A, B drawn by J.-A. Barreña from *Inocencio 70100*, UMH.)

color unknown; ripe seeds brown, $2.4\text{--}2.6 \times 2.2\text{--}2.4 \times 1.6\text{--}1.8$ mm.

Phenology. Flowering and fruiting from May to August.

Distribution and habitat. Mediterranean Region. North Africa [Morocco]. It is the common caper species in the High Atlas Mountains of Morocco. Found in rocky places, slopes, on calcareous substrata or marls, occasional on metamorphic substrata; at

elevations from 0 to 2000 m, often in the vicinity of human dwellings. In the surroundings of Moulay Brahim (Morocco), it grows on clayey slopes along with *Ephedra* L. sp., *Teucrium fruticans* L., *Lavandula* L. sp., *Chamaerops humilis* (J. C. Archibald, 4586, E). Figure 4.

Capparis atlantica is a procumbent shrub with purple-red twigs; *C. aegyptia* is somewhat erect with gray-green or glaucous twigs; and *C. zoharyi* is erect. The stipules are not so strongly decurrent in *C.*

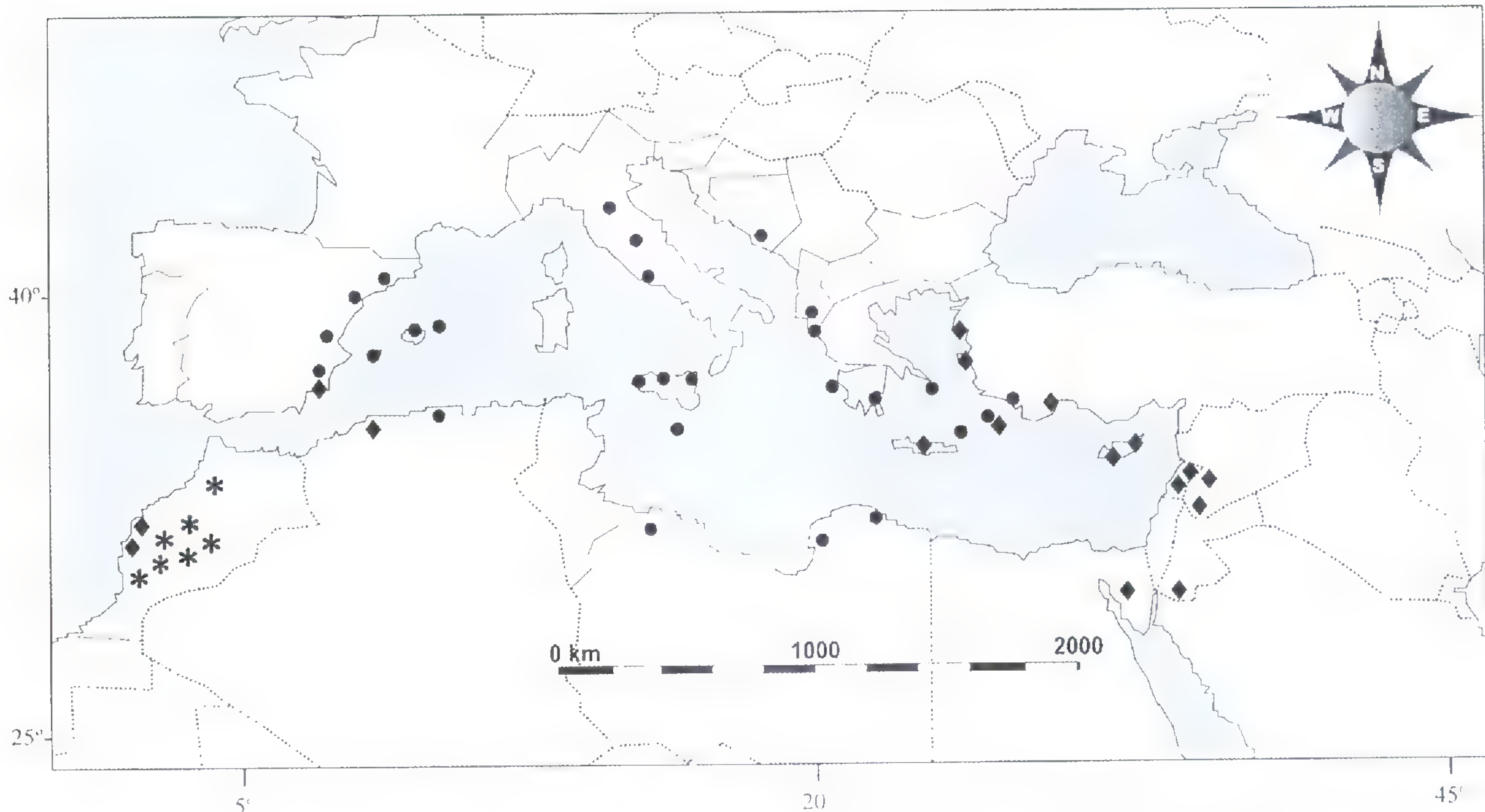


Figure 4. Distribution map for *Capparis atlantica* (*); *Capparis orientalis* (●); and *Capparis zoharyi* (◆).

atlantica as in *C. zoharyi*; the leaf tips of *C. atlantica* are acute, while those of *C. aegyptia* and *C. zoharyi* are rounded.

Paratypes. MOROCCO. Asni, *Inocencio 60005* (UMH); falls of Ouzoud, *Jury 8764* (RNG); Marrakech, *Jury 8783* (RNG); Moulay Brahim, *Archibald 4586* (E); Oued Argauui, *Inocencio 60003* (UMH); Siksoua, Greater Atlas, *Hooker s.n.* (K); Tafraoute, *s.n. 468* (RNG); Tizi n'test, *Inocencio 60034* (UMH).

3. *Capparis hereroensis* Schinz, Bull. Herb. Boissier 1(3): 396. 1895. TYPE: [Southwest Africa = Namibia] “Südwestafrika: Zwischen Wortel und Walfischbai, October 1886, *Schinz 1006*” (lectotype, designated here, Z!).

Shrub erect, almost glabrous; twigs straight, up to 3 m long, yellowish green; internodes 1.3–2.5 cm; stipules antrorse, mostly setaceous, not decurrent, sometimes falling or weak, yellow, 0.2–0.3 cm long, 0.05–0.1 cm wide at the base. Leaves oblong-obovate, 2.3–4.2 × 1–1.6 cm, somewhat fleshy, yellowish green; leaf veins prominent; bases tapering to rounded, apices rounded to somewhat truncate; mucro small, 0.5–1.0 mm, straight; petioles 0.5–1 cm. Flower buds rounded; floral pedicels thick and short, 2.5–4.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.6–1.8 cm long, 0.6–0.8 cm deep; stamens 30 to 80, anthers 2.5–3 mm, with acute apices. Fruit ellipsoidal, pulp color unknown; ripe seeds dark brown, 3.8–4 × 3.6–3.8 × 2.7–3 mm.

Phenology. Flowering from January to April.

Distribution and habitat. Karoo-Namib Region. South Africa [Namibia]. Dune-forming sandy substrate, in coastal zones; at elevations from 0 to 100 m.

The Schinz herbarium is at Z. At Z there are two sheets with type material of *Capparis hereroensis* because holotype is not designated in the protologue. The specimen accompanied by a single handwriting on the sheet with the following text, “*Capparis hereroensis* Schinz/Wortel, Walfischbai/1886/2 Bogen/N° 1006,” is here designated as the lectotype; the specimen on the other sheet, with identical Schinz collection number, is a paralectotype.

Selected specimens examined. NAMIBIA. Walvis Bay Town, Salworks, *Ward 9250* (K); Hereroland, Walfischbai, *Schinz 1006* (Z); Conception Hut, *Ward & Ward 158* (K).

4. *Capparis mucronifolia* Boiss., Diagn. Pl. Orient., Ser. I, Vol. I: 3. 1843. *Capparis spinosa* L. var. *mucronifolia* (Boiss.) Hedge & Lamond, Fl. Ir. Hoch. Umr. Geb.: 7. 1970. TYPE: [Iran or Oman] “Hab. in Persia Australi et Regno Mascatensi, *Aucher 4189*...” (lectotype, designated here, G!).

KEY TO THE SUBSPECIES OF *CAPPARIS MUCRONIFOLIA* IN THE MIDDLE EAST AND CENTRAL ASIA

- 1a. Twigs slightly tortuose; stipules curved, retrorse; leaves ovate, pubescence very lax; flower buds acute at apex a. *C. mucronifolia* subsp. *mucronifolia*
- 1b. Twigs straight; stipules almost straight or somewhat curved, retrorse or often spreading; leaves

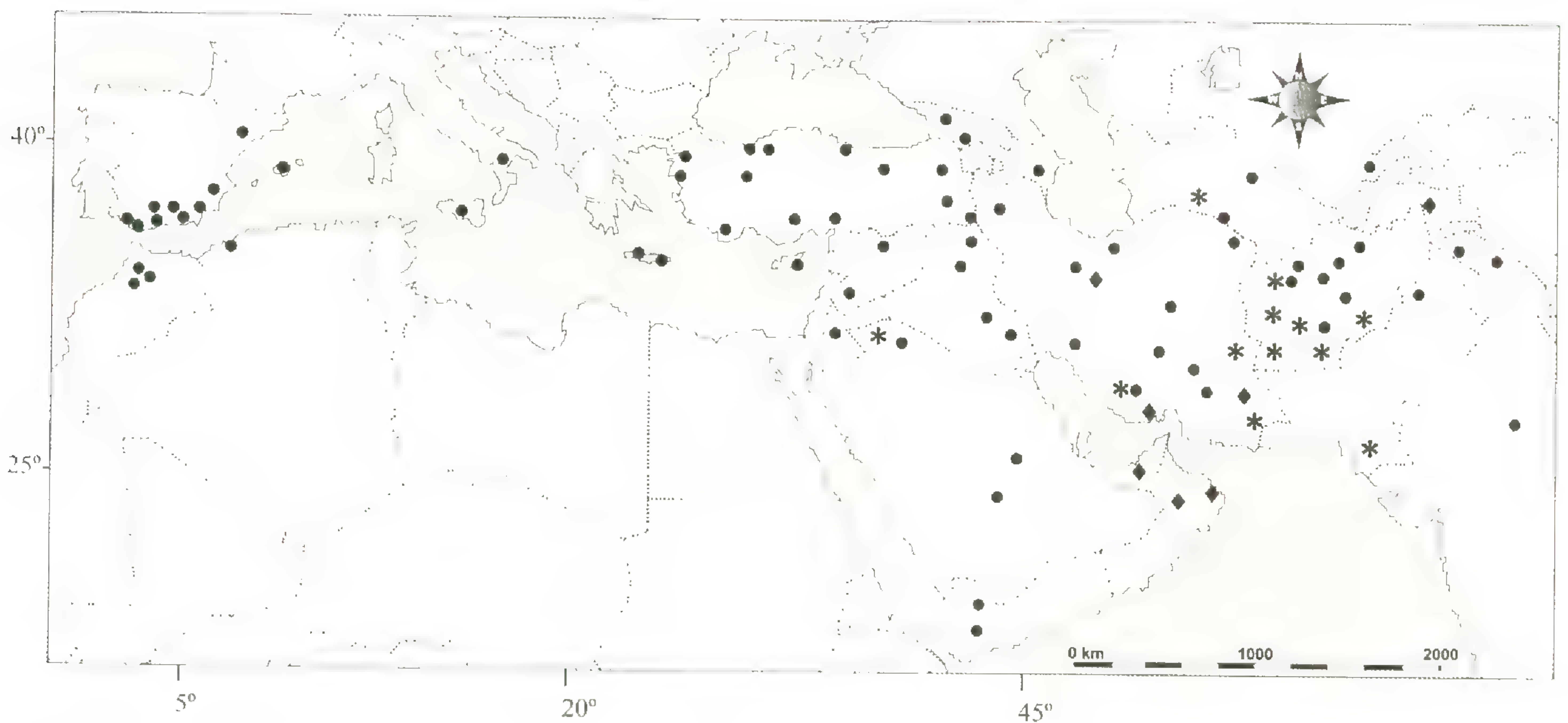


Figure 5. Distribution map for *Capparis parviflora* (*) (three subspecies); *Capparis sicula* (●) (all five subspecies); and *Capparis mucronifolia* (◆) (both subspecies).

oblong-lanceolate, pubescence lax; flower buds rounded b. *C. mucronifolia* subsp. *rosanoriana*

Distribution. Figure 5.

4a. *Capparis mucronifolia* Boiss. subsp. *mucronifolia*

Capparis elliptica Hausskn. & Bornm. ex Bornm. var. *maskatensis* Hausskn. & Bornm. ex Bornm., Mitt. Thür. Bot. Ver. N.F. VI: 49, 1894. TYPE: [Oman] "foliis latoribus ovatis; in rupibus ad Maskat, [J. Bornmüller] ex. 46" (lectotype, designated here, JE!).

Shrub somewhat erect, heavily branched, irregularly and widely spreading, up to 1 m high; twigs slightly tortuose, approximately 2 m long, yellowish or grayish green; internodes 0.5–3 cm; stipules curved, retrorse, not decurrent, golden yellow, apex orange, sometimes pubescent, at least basally, 0.2–0.6 cm long, 0.1–0.2 cm wide at the base. Leaves ovate, 2–4 × 0.5–1.5 cm, somewhat fleshy; indument very lax, trichomes thick and short to long, (20)30–40 × 200–400 μm; leaf veins not prominent; bases usually rounded, sometimes tapering, apices acute; micro small, 0.5–1.0 mm, straight; petioles very short, 0.2–0.4 cm. Flower buds acute; floral pedicels slender, short, 2.5–3.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.4–1.6 cm long, 0.7–0.9 cm deep; stamens 30 to 80, anthers 1.3–1.5 mm, with round apices. Fruit oblong, pulp color unknown; ripe seeds brown, 2.4–2.8 × 1.6–2 × 1.6–1.8 mm.

Phenology. Flowering from March to September.

Distribution and habitat. Sudano-Zambezian and Saharo-Arabian, extending to the Irano-Turanian Regions. Middle East [Afghanistan, Iran, Oman,

United Arab Emirates]. Rocky slopes, ravines and stony plains of deserts, wadies in *Acacia seyal* Del. hammada, at elevations from 0 to 1000 m.

There is no designation of holotype for *Capparis mucronifolia* by Boissier; the type material cited comprises different specimens collected by P. M. R. Aucher Eloy in southern Iran and Oman (former kingdom of Muscat), with collection numbers 4189, 4190, and 4192, during his travels in 1835–1838. Therefore lectotypification is needed. The sheet with the lectotype contains the following labels: I "*Capparis mucronifolia* / Boissier". II "Aucher-Eloy-Herbier d'Orient N. 4189." Paratypes are Aucher pl. exs. 4190 and 4192, G!. Isolectotypes are in K!

Capparis elliptica Hausskn. & Bornm. ex Bornm. Mitt. Thür. Bot. Ver. N.F. VI: 49, 1894, is a later homonym of *Capparis elliptica* Span. ex F. Muell. Fragmenta Phytographiae Australiae 9: 172, 1875; it is within the range of *Capparis mucronifolia* subsp. *mucronifolia*.

There is no designation of holotype for *Capparis elliptica* var. *maskatensis* Hausskn. & Bornm.; the type material cited comprises different specimens collected, under number 46, by J. Bornmüller in his "Iter Persico-turcicum 1892–1893." Haussknecht's herbarium is at JE; Bornmüller worked from 1904 as curator in JE, but sold his herbarium to B. Most of the Bornmüller Capparidaceae material at B was destroyed during the Second World War. One *Capparis* specimen with collection number 46 is at JE (J. Müller, pers. comm.). Therefore lectotypification is needed and possible. The sheet with the lectotype contains the following labels: I "Isotypus/ *Capparis elliptica* Hausskn. & Bornm./ var. *maskatensis* Hausskn. & Bornm." II "J. Bornmüller: Iter Persico-

turcicum/ 1982–93/ No 46/ *Capparis spinosa* L. v./ *Maskatensis* Hsk. & Bornm./ determ.:/ Arabia australis: in saxosis ad Maskat/ 1893. 25–5 legit: J. Bornmüller.”

Selected specimens examined. AFGHANISTAN. Griffith, Lemann 374 (K). IRAN. Bangar Langeh, Davis & Bokhari, D. 56176 (E); Chahbahar, Baluchistan, Runemar 22417 (E); Zahedan, Gray-Wilson & Hewer 263 (K); Hormuz, J. Bornmüller 5 (K). OMAN. Istal, Wadi Bani Kharus, Radcliffe-Smith 4045 (K); Ruwi near Muscat, Miller 6003 (E). UNITED ARAB EMIRATES. Hatta, Dubai, Western 267 (E); Fujairah, Lumley 38 (K).

4b. *Capparis mucronifolia* Boiss. subsp. *rosanoviana* (B. Fedtsch.) Inocencio, D. Rivera, Obón & Alcaraz, comb. et stat. nov. Basionym: *Capparis rosanoviana* B. Fedtsch., Beih. Bot. Centralbl. 20: 297. 1906. *Capparis rosanoviana* B. Fedtsch., Consp. Fl. Turk. Vol. II: 98. 1909. TYPE: [Tajikistan] “Ost-Buchara: am östlichen Abhänge der Berge Aryktau, höher als Goranty, auf Felsen, 1900–2000’, am 3. [= 15.] April 1883 (A. Regel!).” (lectotype, designated here, LE!).

Shrub somewhat erect, well branched from base, irregularly and widely spreading, up to 1 m high; twigs straight, erect or decumbent, up to 2 m long, yellowish or grayish green; internodes 1–2 cm; stipules almost straight or somewhat curved, retrorse, often spreading, not decurrent, yellow-golden, 0.2–0.4 cm long, 0.1–0.2 cm wide at the base. Leaves oblong-lanceolate, 1.5–2 × 0.4–2 cm, somewhat fleshy; indument very lax, trichomes thick and long, 20–30 × 200–400 µm; leaf veins not prominent; base usually rounded, apices acute; mucro long, 1–1.5 mm, straight; petioles very short, 0.1–0.3 cm. Flower buds rounded; usually with indument at least at the base; floral pedicels slender, short, 2–3 cm; flower shape unknown. Fruit unknown; ripe seeds unknown.

Illustrations. Bobrov (1939: 7, tab. 1, fig. 2; 1970: 8, tab. 1, fig. 2).

Phenology. Flowering and fruiting from July to August (Bobrov 1939: 3; 1970: 5).

Distribution and habitat. Irano-Turanian Region. Middle East [Tajikistan]. At the eastern slope of the mountains Aryktau, above Goranty and on the left bank of the River Vakhsh, between Kurgan-Tyube and Lechman. Limestone, sunny rocky slopes, and sandy substrata; from 600 to 1500 m. Also in the Kafimigan, Pani, and Amudarya river valleys, in southwestern Tajikistan (Anonymous, 2005).

According to Regel (in sched., LE), the fresh flowers display a corolla with yellowish tints, and the staminal filaments are reddish. The dried fruits are

oblong-lanceolate, with marked longitudinal nerves (Fedtschenko & Fedtschenko, 1906).

There is no designation of holotype by B. Fedtschenko; the type materials cited are different specimens collected by E. A. von Regel in southwestern Tajikistan (former Bukhara region) during his travels in 1883. Therefore lectotypification is needed. Two sheets have been found by Vladimir Dorofeev in LE containing type material. The sheet with the lectotype contains the following label: I “A. Regel, Iter Turkestanicum/ In decliv. Orient. montium Aryktau [am östlichen Abhänge der Berge Aryktau/ supra Horanty [höher als Goranty] 1200–2000’/ 3–15/ VIII 1883.” The sheet with the paralectotype contains the labels: I “August 1883/ 14/ Sandstrecken zwischen Kurgantüfe/ und Lechman, 1200–1300’/ (links Wachschufer).” II “A. Regel, Iter Turkestanicum/ Sandstrecken zwischen Kur-/ gantüfe und Lechman 1200–1300’/ (links Wachschufer)” (LE!).

Selected specimens examined. TAJIKISTAN. Kadajian, s.n. 277 (E); between Kurgan Tyube and Lechman, Regel s.n. (LE); eastern slopes of Aryktau mountain, Regel s.n. (LE).

5. *Capparis orientalis* Veill., in Duhamel, Traité Arbr. Arbust. ed. 2, 1: 142. 1801. *Capparis spinosa* L. subsp. *orientalis* (Veill.) Jafri, Flora of Libya, Vol. XII: 3. 1977. TYPE: “*Capparis non spinosa fructu majore* C. Bauh. Pin. 480...” (lectotype, designated by Rivera et al. (2006), the image in J. Bauhin, J. Cherler & D. Chabrey, Hist. Plant. Vol. II: 63. 1651!; epitype, designated by Rivera et al. (2006), [Greece] Sokastro, Dodecanese, Th. Raus 8382, E!).

Capparis rupestris Sm., Fl. Graec. Prodr. Vol. I: 355. 1809. *Capparis spinosa* L. subsp. *rupestris* (Sm.) Nyman, Consp. Fl. Eur.: 68. 1878. *C. spinosa* L. var. *rupestris* (Sm.) Hook. f. & Thoms., in Hook. f., Fl. Brit. India Vol. I: 173. 1872. TYPE: [Greece, Crete] “In Cretâ et Antiparo insulis, ad rupes” (lectotype, designated here, OXF!).

Shrub pendulous or decumbent, sometimes reaching great dimensions in shaded sites, glabrous; twigs straight, dark green, sometimes reaching more than 3 m long; internodes 2–7 cm; plants unarmed, occasionally vestigial stipules are early falling. Leaves rounded, or somewhat ovate, 3–8.5 × 2.3–8 cm, somewhat fleshy; leaf veins not prominent; base rounded, sometimes cordate, apices obtuse, sometimes obcordate, rarely acute; mucro lacking or very small, 0.1–0.5 mm; petioles long, 1–2.5 cm. Flower buds rounded, rarely acute; floral pedicels thick and long, 5–8 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1–1.5 cm long, 0.6–

0.8 cm deep; stamens 30 to 80, anthers 2–3 mm, with round apices. Fruit ellipsoidal, with apices nipple-shaped, pulp red; ripe seeds dark brown, $3.2\text{--}3.6 \times 2.8\text{--}3 \times 2.8\text{--}3$ mm.

Illustrations. Figure 1 in Ali & Jafri (1977: 5). Guerau & Torres (1981: 31).

Phenology. Flowering from May to October.

Distribution and habitat. Mediterranean Region. Mediterranean Europe and North Africa [Albania, Algeria, Croatia, Greece, Italy, Libya, Malta, Spain, Turkey]. Rocks, cliffs, walls of old buildings, at elevations from 0 to 600 m, often surrounding human dwellings. Figure 1.

Capparis orientalis was described by Veillard in Duhamel (1801: 142), apparently fundamentally based on the pre-Linnaean literature. He gives three synonyms, listing the authors and references where these have appeared previously. Also, further material is cited in pages 142–143, after the discussion of the species. The references to the habitat and distribution are restricted to: “Les rochers de l’isle de Crète et des isles de l’Archipel, particulièrement celle d’Antiparos; en Syrie et dans la Palestine.” Both localities and bibliographical references—including illustrations—furnish fundamental elements for determining the original material of Veillard. The author himself places different values on the material used. Part of the material is only indirectly cited in the discussion after the protologue, in which several additional authors, localities, and icon are cited. The new species is not illustrated in the original paper. Veillard’s herbarium is unknown because it was apparently part of the missing Duhamel herbarium (Stafleu & Cowan, 1976). Thus the only original materials available for typification are the two images cited by Veillard. The remaining references are unillustrated. Lonicer’s icon (Lonicer, 1679: 106) may be discarded, as Veillard himself noted the poor quality of this drawing. However, it clearly represents an unarmed caper bush with rounded leaves. The illustration in Bauhin et al. (1651: 63) is cited by Veillard in the pre-Linnaean synonymy of *C. orientalis* and was selected as lectotype by Rivera et al. (2006).

According to Veillard in Duhamel (1801), this species was collected in Palestine and Syria by travelers such as Pockocke and Shaw. We have not found any plant material of this species from the Levant, neither from these collectors nor others. However, it is likely that the species occurred in the area.

There is no designation of holotype for *Capparis rupestris* Sm. Serena Marner (pers. comm.) did find a single specimen (one blossoming branch and

a branch with a young fruit) of *Capparis rupestris* in one sheet of the Sibthorpean Herbarium at OXF corresponding to the Fl. Graec. Prodr. Vol. I: 355. 1809, number 1190, which is also associated with Fl. Graec. T. 487. The sheet of *Capparis rupestris* is a very typical one from the Sibthorpean Herbarium. The cited illustration [Tab. 487] was later published (Smith, 1825); however, it is also original material. The citation “Folia quam in praecedente crassiora et succo pleniora. Olivier” is certainly Olivier (1801–1807). Guillaume Antoine Olivier was a French naturalist who traveled in Greece, Turkey, the Levant, and other Middle Eastern countries between 1792 and 1798. Therefore, lectotypification is needed. We have seen the sheet (OXF) with the lectotype, which contains neither references to localities nor collectors. However it is clearly labelled “*C. rupestris*/Sib.” [written in the hand of J. E. Smith] and “J. Sibthorp, M.D.” [None of the material has the localities written directly on the sheets in the Sibthorpean Herbarium at OXF.] The specimen is typical of a specimen collected on the first voyage in 1786 or 1787 (Serena Marner, pers. comm.). It is in agreement with the description in the protologue. The sheet contains further stamp and annotation with reference to the Prodr. Flora Graeca [added by M. A. Lawson, Sherardian Professor of Botany at Oxford (Lack, 1997)]. Therefore, the specimen is reasonably original material and is designated here as a lectotype.

Selected specimens examined. ALBANIA. Berirk Saranda, Krendl s.n. (C); Sarandë, Alston 2248 (K). ALGERIA. Cape Carbon, Bejaia, Davis 52961 (E). CROATIA. Cavtat, Larsen s.n. (C); Lapad, Dubrovnik, Larsen s.n. (C); Dubrovnik, Clement s.n. (RNG). GREECE. Argolis, Tolon, Bowen 6507 (RNG); Karpathos, Islet Sokastro, Davis 8382 (E); Sokastro, Dodecanese, Th. Raus 8382 (E); Kiklades, Andros, Jury 271 (RNG); Corfu, Markos, Davis 54537 (E); Gerolimenas, 28379 (C); Island Zakynthos, Boratynski 728 (C); Port Kheli, Lewis 642 (K); Rhodes, Ahaussen s.n. (C). ITALY. Florence, s.n. (C); Palermo, R. Coll 314 (E); Perugia, Ransone 410 (E); Pisa, Savi 429 (K); Rome, Larsen 4874 (C); Sicily, Taormina, Island Bella, Ostenfeld s.n. (C); Messina, S. P. Brookes 5754 (RNG); Favignana, Cape Calarossa, J. R. Akeroyd 545 (RNG); Island Leranzo, Davis 40174 (RNG). LIBYA. Coefia, N of Benghazi, Davis 50477 (E); Gebel Nefoussa, Davis 49670 (E); Kouf, J. H. H. I. 26 (K); Shahat, Ali 624 (E). MALTA. Addaloute Cemetery, Lanfranco 5967 (RNG); Malta, Wright s.n. (K). SPAIN. **Alicante:** Gram 2039 (C); Santa Barbara Castle, Inocencio & Alcaraz 60048 (MUB). **Barcelona:** Barcelona, Sennen 1587 (RNG). **Ibiza:** Santa Eulalia, Cannon 3256 (RNG). **Mallorca:** Palma de Mallorca, Inocencio & Alcaraz 48696 (MUB); Alcudia, Inocencio & Alcaraz 48697 (MUB); Valldemosa, Jacobsen s.n. (C). **Menorca:** Punta Nati, Rita s.n. (RNG). **Tarragona:** Benifayet, Inocencio & Alcaraz 48701 (MUB). **Valencia:** Liria, Inocencio & Alcaraz 48700 (MUB). TURKEY. Mugla Province, Marmaris District, Prance 116 (E).

- 6. *Capparis ovata*** Desf., Fl. Atlant., Vol. I: 404. 1798. *Capparis spinosa* L. var. *ovata* (Desf.) Batt., in Batt. & Trabut., Fl. Algérie: 82. 1888. TYPE: [Algeria] “Habitat in fissuris rupium prope Oran” s.c. (lectotype, designated here, P 948!).

KEY TO THE SUBSPECIES OF *CAPPARIS OVATA* IN THE MEDITERRANEAN REGION, THE MIDDLE EAST AND NORTH AFRICA

- 1a. Young leaves usually ovate to ovate-lanceolate, mature leaves ovate, $2.5-5 \times 2-4.5$ cm; stipules antrorse a. *C. ovata* subsp. *ovata*
1b. Young leaves usually lanceolate, mature leaves ovate-lanceolate, $2.5-4 \times 0.9-1.9$ cm; stipules retrorse b. *C. ovata* subsp. *myrtifolia*

Distribution. Figure 2.

6a. *Capparis ovata* Desf. subsp. *ovata*

Capparis sicula Veill. var. *kruegeriana* Pamp., L'Agricoltura Col. 22: 459. 1926. *Capparis spinosa* L. var. *rupestris* forma *kruegeriana* (Pamp.) Pamp., Prodr. Fl. Ciren.: 234. 1931. *Capparis spinosa* L. subsp. *orientalis* (Veill.) Jafri. var. *kruegeriana* (Pamp.) Jafri., Flora of Libya. Vol XII: 4. 1977.

Shrub pendulous, sometimes reaching great dimensions in shaded sites; twigs straight, up to 3 m long, dark green or with a reddish tint in younger twigs, adult ones becoming woody, acquiring grayish or brown color; internodes 1.5–2.5 cm; stipules curved, mostly antrorse, sometimes spreading, not decurrent, sometimes very small or early falling, yellow, 0.15–0.4 cm long, up to 0.1 cm wide at the base. Leaves usually ovate, when young ovate to ovate-lanceolate, $2.5-5.5 \times 2-4.5$ cm, subcoriaceous; indument lax, trichomes thick and short, $30-40 \times 200-250$ μ m; leaf veins not prominent; base usually rounded or somewhat tapering, apices acute; mucro small, 0.5–1 mm, straight; petioles short, 0.5–1 cm. Flower buds acute; floral pedicels thick, long, 4.5–6.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.5–1.7 cm long, 0.7–0.9 cm deep; stamens 30 to 80, anthers 2–3 mm, with round apices. Fruit obovate, pulp yellow; ripe seeds dark brown, $2-2.2 \times 2.2-2.4 \times 1.6-1.8$ mm.

Illustrations. P. Ozenda (1991: 246, fig. 68); Lewalle & Montfort. (1997: 25); A. Benchelah et al. (2000: 147); Charco (2001: 283).

Phenology. Flowering from April to December.

Distribution and habitat. Saharo-Arabian and Mediterranean Regions. North Africa [Algeria, Libya, Morocco, Tunisia]. On rocks or walls of old buildings, at elevations from 0 to 2000 m, often in the vicinity of human dwellings.

Selected specimens examined. ALGERIA. Ahaggar, Tezzeit, 1750 m, *Maire 180* (P); Bejaia, *Reverchon s.n.* (E); Djanet, Tamli of Tafalelet, *Lhote 107* (P); Oranais, *Faure*

s.n. (E). LIBYA. Coefia, Benghazi, *Davis 50477* (RNG); Gebel Nefoussa, Giado, *Davis 49678* (RNG); Tripolitania, Tarhunah, *Keith 1038* (K). MOROCCO. Driouch, *Inocencio 60029* (MUB); Gorge du Ziz, Er-Rachidia, *Jury 17819* (RNG); Fez, *Mateos 6653/95* (RNG); Imzourene, *Jury 15602* (RNG); Msemrir, Dadés, *Jury 17776* (RNG); Nador, Kebdana, *Romo 6501* (RNG); Ouarzazate, *Brooks E.5349* (RNG); Dj. Sarhoro, Ouarzazate, *Davis 53476* (E); River Yanoile, *Inocencio 60021* (MUB); Safi, *Inocencio 60024* (MUB); Taroudannt, *Jury 14453* (RNG); Taza, *Jury 8602* (RNG); Sidi Belkassen, *Ratherford s.n.* (RNG); Tnant, *Ratherford BV1281/93* (RNG); Tazeka, *Jury 16777* (RNG); Zaio, *Inocencio 60000* (MUB). TUNISIA. Kabyliya, *Letourneux s.n.* (P); Khargued, *Letourneux s.n.* (P); Fedj el Kheirs, *Letourneux s.n.* (P).

The sheet 948 at P contains two branches with leaves and without flowers or fruits; the specimen to the right is selected as a lectotype. It is labelled as “Herbier de la Flore Atlantique/ doné au Muséum par Desfontaines/ N°/ *Capparis ovata*.” Another label states “Habitat in fissuris rupium prope Oran.” In the protologue, Desfontaines also cites seven pre-Linnaean references associated with images of a *Capparis* species known since at least the 1st century AD from the coasts of Marmarica (northern Libya and Egypt), which is without doubt *Capparis ovata* s. str. However, other authors interpreted these as belonging to *C. spinosa* or *C. sicula*.

Candolle (1824) raised the question of homonymy with *Capparis ovata* M. Bieb. On account of this supposed homonym he proposed naming the species from Algeria with the type material by Desfontaines: *Capparis fontanesii* DC. Prodr. Vol. I : 245. 1824. TYPE: “in fissuris rupium Mauritaniae prope Oran...v.s. sine fl. in h. Desf.” There is no reason to adopt this view of Candolle because *C. ovata* M. Bieb. is a later homonym (Bieberstein, 1808).

- 6b. *Capparis ovata*** Desf. subsp. *myrtifolia* Inocencio, D. Rivera, Obón & Alcaraz, subsp. nov. TYPE: [Chad] “Habitat in fissuris rupium Enneri Gousa, Tibesti, 3000’, 15 Mar. 1953, *Guichard KG/TIB/40*” (holotype, the specimen with the label “KG/TIB/40”, P!).

Foliis angustis lanceolatis, stipulis valde retrorsis a typo differt.

Shrub pendulous, sometimes reaching great dimensions in shaded sites; twigs straight, dark green or with a reddish tint in younger twigs, adult ones becoming woody, acquiring grayish or brown color; internodes 1.5–2.5 cm; stipules curved, retrorse, not decurrent, 0.2–0.4 cm long, up to 0.1 cm wide at the base. Leaves usually ovate-lanceolate, the young leaves usually lanceolate, $2.5-4 \times 0.9-1.9$ cm, subcoriaceous; indument lax, trichomes thick and short, $30-40 \times 200-250$ μ m; leaf veins prominent; base somewhat tapering, apices acute; mucro small, 0.5–1 mm,

straight; petioles short, 0.5–1 cm. Flower buds acute; floral pedicels thick and long, 4.5–6.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.2–1.5 cm long, 0.5–0.7 cm deep; stamens 30 to 80, anthers 2–3 mm, with round apices. Fruit obovate, pulp yellow; ripe seeds dark brown, $2\text{--}2.2 \times 2.2\text{--}2.4 \times 1.6\text{--}1.8$ mm.

Phenology. Flowering from (September)January to March.

Distribution and habitat. Saharo–Arabian Region. North Africa [Algeria, Chad]. On rock crevices, from 1000 to 2000 m.

The *Capparis ovata* populations of the Central Sahara mountains show distinct retrorse stipules (as most species in section *Capparis*) in contrast to *C. ovata* populations of North Algeria and Morocco which have mostly antrorse, sometimes spreading, not decurrent, sometimes very small or early-falling stipules. The type of stipules is a character very distinct and constant. The leaves are narrower and the floral pedicels are longer in the Central Sahara specimens. This led us to distinguish this new subspecies, that is subordinated to *C. ovata*. Otherwise it has some likeness to *C. cartilaginea* Decne., which is also present in the area, but the strongly zygomorphic flowers of the latter species (which we included in another section) are not found in *C. ovata* subsp. *myrtifolia*.

Paratypes. ALGERIA. Darmouilly, W of Tamanrasset, Chipp 28 (K); Tamanrasset, Chipp 28 (P). CHAD. Aouzi, Tibesti, Dalloni s.n. (P); Ennerdi, Tibesti, Dalloni s.n. (P); Gozou, Ennerdi, St. Serole 57 (P); Gorges L'Oudingueur, Tibesti, Brookt 52 (K); Enneri Gousa, Tibesti, 1000 m, Guichard s.n. (P).

- 7. *Capparis parviflora* Boiss., Diagn. Pl. Orient., Ser. I, Vol. I: 4. 1843. *Capparis spinosa* var. *parviflora* (Boiss.) Boiss., Fl. Orient. Vol. I: 420. 1867. *Capparis leucophylla* DC. var. *parviflora* (Boiss.) Zohary, Bull. Res. Council Israel 8 D: 59. 1960. TYPE: [Iran] "Hab. in Persia australi. Aucher pl. exs. N 4191 et 4191 A" (lectotype, designated here, G!, G8503).**

KEY TO THE SUBSPECIES OF *CAPPARIS PARVIFLORA* IN THE MIDDLE EAST AND CENTRAL ASIA

- 1a. Fruit oblong or elliptical; twigs yellow green; mature leaves ovate-rounded, $0.5\text{--}2.5 \times 0.5\text{--}2$ cm, pubescence from dense to almost glabrous . . . 2
- 2a. Fruit oblong; mature leaves ovate-rounded, $0.5\text{--}2 \times 0.5\text{--}2$ cm; pubescence from dense to lax a. *C. parviflora* subsp. *parviflora*
- 2b. Fruit ellipsoidal; mature leaves ovate-lanceolate, rarely obovate, $1\text{--}2.5 \times 0.7\text{--}2$ cm; pubescence almost glabrous b. *C. parviflora* subsp. *kurdica*
- 1b. Fruit rounded; twigs yellow green to gray-white; mature leaves obovate to ovate-rounded, $0.7\text{--}1 \times 0.6\text{--}1$ cm; pubescence dense c. *C. parviflora* subsp. *sphaerocarpa*

Distribution. Figure 5. This *Capparis* species shows a geographical pattern of variation.

7a. *Capparis parviflora* Boiss. subsp. *parviflora*

Capparis murrayana Graham, Cat. Pl. Bombay: 9. 1839. TYPE: [India] "On veins of trap rock in the bottom of ravines at Mahableschwur [Mahabaleshwar], rare; at Loghur (Sir C. Macolm.) - about Hurrychunderjee (Dr. Gibson)" (not seen).

Shrub procumbent, up to 75 cm high; twigs straight, up to 2 m long, light green or yellowish green; internodes 0.5–1.5 cm; stipules somewhat curved, retrorse, not decurrent, golden yellow, contrasting with the twigs, 0.3–0.5 cm long, 0.1–0.2 cm wide at the base. Leaves ovate-rounded, $0.5\text{--}2 \times 0.5\text{--}2$ cm, herbaceous; indument variable from dense to lax, trichomes thin and long, $20\text{--}25 \times 300\text{--}900$ μm ; leaf veins not prominent; base acute to tapering, apices rounded or acute; mucro very small, 0.1–0.5 mm, straight; petioles very short, 0.3–0.5 cm. Flower buds rounded or slightly acute; floral pedicels slender, short, 1.5–2.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.2–1.4 cm long, 0.5–0.6 cm deep; stamens 30 to 80, anthers 1.3–1.5 mm, with round apices. Fruit oblong, pulp red; ripe seeds brown, $2\text{--}2.2 \times 1.8\text{--}2 \times 1.6\text{--}1.9$ mm.

Phenology. Flowering and fruiting from (April)May to September.

Distribution and habitat. Irano-Turanian and Saharo-Arabian Regions, extending to the Sudano-Zambezian Region. Middle East and Central Asia [Afghanistan, Iran, Pakistan, Saudi Arabia, Turkmenistan]. Cliffs, stony places, and slopes, in semi-deserts; from 650 to 1850 m.

A holotype was not designated for *Capparis murrayana* Graham (1839). The John Graham Herbarium has not been found.

Selected specimens examined. AFGHANISTAN. Herat, Hedge & Lamond s.n. (K); Kandahar Pirzada, Edelberg 2052a (C); Kandahar Pirzada, Hedge & Lamond 2052a (C); Kajakay, Petersen 152 (E); Kajakay, Hedge & Lamond 2142 (C); Province of Chakhansur, 2 km to the N of Lashe Jowayn, Breckle 4928 (E); Shin Dand, 10 mi. S, Furse s.n. (K); Zint Gorge, Mam district, 8 June 1958, Chapman 26096 (K). IRAN. Fars, Kuh-i-Bamus, Schiras, Archibald 2940 (E); Kuh-e-Hari, A. J. Lee 83 (K); Schiras, Kotschy 309 (E); Schiras, Hohenacker 309 (C). PAKISTAN. Tando Jan, Jafri 2406 (E). SAUDI ARABIA. Aflja Well, J. D. Dwyer 13125 (RNG); Turayf, Collenette 4495 (K). TURKMENISTAN. Ashjabad, s.n. (E).

7b. *Capparis parviflora* Boiss. subsp. *kurdica* (Zohary) Inocencio, D. Rivera, Obón & Alcaraz, stat. et comb. nov. Basionym: *Capparis ovata* Desf. var. *kurdica* Zohary, Bull. Res. Council Israel, Vol. 8D, 56. 1960. TYPE: [Iraq] “Rupes Mt. Singarae [Djabal Sindjar], Mai 1867 C. Haussknecht s.n.” (holotype, K!).

Shrub procumbent, almost glabrous; twigs straight, up to 2 m long, yellowish green; internodes 1.5–3 cm; stipules somewhat curved, retrorse, somewhat to very widely spreading, not decurrent, golden yellow, contrasting with the light twigs, 0.2–0.4 cm long, 0.1–0.2 cm wide at the base. Leaves ovate-lanceolate, rarely obovate, 1–2.5 × 0.7–2 cm, herbaceous; leaf veins not prominent; base rounded or somewhat tapering, apices acute to rounded; mucro very small, 0.1–0.5 mm, straight; petioles very short, 0.3–0.5 cm. Flower buds rounded; floral pedicels slender, short, 2–3.5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 0.9–1.2 cm long, 0.4–0.6 cm deep; stamens 30 to 80, anthers 1.5–1.8 mm, with rounded apices. Fruit ellipsoidal, pulp red; ripe seeds dark brown, 3.2–3.8 × 2.2–2.6 × 2.4–2.2 mm.

Phenology. Flowering from June to September.

Distribution and habitat. Irano Turanian Region. Middle East [Afghanistan, Iran, Iraq]. Cliffs, ravines, in stony places, from 200 to 700 m.

Selected specimens examined. AFGHANISTAN. Chakhansur, Zaranj, Breckle 4905 (E). IRAN. Avroman, Schahu, Haussknecht s.n. (K). IRAQ. Bilas, Raui 29409 (K); Darvidikhan, 1536 (E); Zint gorge, Mam district, Chapman 26096 (K).

7c. *Capparis parviflora* Boiss. subsp. *sphaerocarpa* Inocencio, D. Rivera, Obón & Alcaraz, subsp. nov. TYPE: [Afghanistan] “Herat:105 Km S Herat versus Shindand, K. H. Rechinger, *Iter Orientale* 1967/37579” (holotype, E!). Figure 6.

Foliis minoribus, usque ad 1 cm longis latisque, fructibus brevioribus globosis non oblongis a typo differt.

Shrub procumbent, up to 75 cm high; twigs straight, up to 2 m long, yellowish green or grayish-whitish; young twigs very thin with very short internodes (0.1–0.3 cm) and very spiny; longer adult twig internodes 0.3–1 cm; stipules somewhat curved, retrorse, usually very open, slightly spreading to widely spreading, slightly decurrent to not decurrent, golden yellow contrasting with whitish twigs, 0.3–0.5 cm long, 0.1–0.2 cm wide at the base. Leaves obovate to ovate-rounded, the young rounded, 0.7–1 × 0.6–1 cm, herbaceous; indument dense, trichomes thin and long, 20–25 × 350–800 µm; leaf veins not prominent;

bases tapering to rounded, apices rounded or weakly acute; mucro very small, 0.1–0.5 mm, straight; petioles very short, 0.1–0.3 cm. Flower buds rounded; floral pedicels slender, short, 1.5–2 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 0.8–1.1 cm long, 0.3–0.6 cm deep; stamens 30 to 80, anthers 1.2–1.5 mm, with round apices. Fruit rounded, pulp red; ripe seeds dark brown, 2.6–2.8 × 1.6–1.8 × 2.3–2.8 mm.

Phenology. Flowering and fruiting from (April) May to August(September).

Distribution and habitat. Irano-Turanian Region. Central Asia [Afghanistan, Turkmenistan]. Cliffs and stony slopes, from 600 to 2000 m.

The sheet with the holotype (at E) is labelled as follows: I “K.H. Rechinger, *Iter Orientale* 1967/37579/ *Capparis spinosa* L./Var. *parviflora* (Boiss.) Boiss./Sw-Afghanistan, Herat:105 Km S Herat Versus Shindand, 1300 M.” II “Det. Hedge & Lamond, 1968/ 7.VIII.”

Paratypes. AFGHANISTAN. Chakhansur, Zaranj, Breckle 4928 (E); Fariah, Hedge, Wendelbo & Ekberg W 7674 (E); Herat, Hedge & Lamond 37579 (K); Shind Dand, Furse 5488 (K). TURKMENISTAN. Asjabad. Vikitin & Ivanov s.n. (E).

8. *Capparis sicula* Veill., in Duhamel, *Traité Arb. Arbust.*, Ed. 2, 1: 159. 1801. *Capparis ovata* var. *sicula* (Veill.) Zohary, Bull. Res. Council of Israel, 8D: 55. 1960. *Capparis spinosa* subsp. *sicula* (Veill.) Holmboe, Borg. Mus. Skr. Ny Raekke. Bird I, 2: 1–344. 1914. TYPE: [Italy] “*Capparis Sicula duplicata spina, folio acuto*. Boccone, 1666 [1674]. *Icon. et descript. Rarior. Plantar. Sicil.* P. 79. tab. 42. f. 3. Cupani Hort. Cathol. P. 36” (lectotype, designated by Rivera et al., 2006, Boccone’s image, *Icones et descriptiones rariorum plantarum Siciliae, Melitae, Juliae et Italicae*: 79. tab. 42. f. 3. 1674!).

KEY TO THE SUBSPECIES OF *CAPPARIS SICULA* IN THE MEDITERRANEAN REGION, NORTH AFRICA, THE MIDDLE EAST, AND CENTRAL ASIA

- 1a. Plants with stipules straight, spreading 8b. *C. sicula* subsp. *herbacea*
- 1b. Plants with stipules curved, retrorse 2
- 2a. Leaf pubescence lax, very lax, or almost glabrous 3
- 3a. Twigs dark green; leaf pubescence lax, trichomes thick and long, 20–50 × 400–800 µm; floral pedicel thick and long, 5.5–7 cm 8a. *C. sicula* subsp. *sicula*
- 3b. Twigs light green, white, or yellow; leaves glabrous or with very lax pubescence, trichomes thin and short, 15–20 × 100–250 µm; floral pedicel slender and short, 1–4.5 cm 1
- 4a. Leaf pubescence very lax; stipules curved, retrorse, yellow-orange; anthers small, 2–2.5 mm. 8d. *C. sicula* subsp. *mesopotamica*

- 1b. Leaf almost glabrous; stipules somewhat curved, retrorse or spreading, golden yellow contrasting with the light color of twigs; anthers very small, 1.6–2 mm 8e. *C. sicula* subsp. *sindiana*
- 2b. Leaves appearing white due to dense pubescence 8c. *C. sicula* subsp. *leucophylla*

Distribution. Figure 5.

8a. *Capparis sicula* subsp. *sicula*

Capparis spinosa var. *canescens* Coss., Anal. Sci. Nat., 11: 28, 1849. *Capparis spinosa* subsp. *canescens* (Coss.) A. & O. Bolòs, Misc. Fontserè: 88, 1961. *Capparis ovata* Desf. var. *canescens* (Coss.) Heywood, Feddes Repert. 69: 56, 1964. TYPE: [Spain] "In rupestribus oppiduli Buenavista prope Xerez (E. Bourgeau, pl. Esp. 1849, n. 43)" (lectotype, designated here, P!).

Capparis ovata var. *palaestina* Zohary, Bull. Res. Council Israel 8D: 55, 1960. TYPE: [Israel] Upper Galilee, Wadi Hindaj, 25 June 1954, M. Zohary 110 (holotype, HUJ!).

Shrub procumbent; twigs straight, sometimes reaching up to 3 m long, dark green; internodes 1.5–5 cm; stipules curved, retrorse, not decurrent, occasionally slightly decurrent, yellow-orange, 0.3–0.6 cm long, 0.2–0.3 cm wide at the base. Leaves ovate, oblong or elliptic, 3–5 × 2–4.5 cm, herbaceous; indument lax, trichomes thick and long, 20–50 × 400–800 µm; leaf veins not prominent; base rounded or somewhat tapering, apices acute; mucro long, 1–1.5 mm, usually curved; petioles short, 1–1.5 cm. Flower buds acute; floral pedicels thick and long, 5.5–7 cm; flowers zygomorphic; abaxial (odd) sepal galeate, 1.7–2.5 cm long, 0.7–1.2 cm deep; stamens 100 to 150, anthers 2.5–3 mm, with acute apices. Fruit oblong, pulp red; ripe seeds dark brown, 2.6–3 × 2.4–2.8 × 2–2.2 mm.

Illustrations. Boccone (1674: 79, tab. 42, f. 3); Zohary (1966: 359); Valdés et al. (1987: 374); Castroviejo et al. (1993: 520, pl. 142); Plitmann et al. (1983: 81); O. Fragman et al. (2001: 312–3, pl. 133).

Phenology. Flowering May to October.

Distribution and habitat. Mediterranean and Irano-Turanian Regions; locally introduced in the Saharo-Arabian Region, Mediterranean Europe, North Africa, Middle East into Turkey [Albania, Algeria, Cyprus, Greece, Italy, Morocco, Spain, Syria, Turkey]. Stony places, marls or clayish soils, scrubs, at elevations from 0 to 600 m; in the vicinity of human dwellings.

Selected specimens examined. ALBANIA. Below Levani and Frascula district, M. Barat, *Baldaci* 197 (K). ALGERIA. Orán, *Faure* s.n. (K). CYPRUS. Cape Greco, *Gold* 29 (RNG). GREECE. Baths of Eretria, Island Euboea, *Stamatiadhou* 17290 (C); Crete, Kissamos, *Bickerich* 15091 (K); Irakliou, *Bowen* 8913 (RNG); Fokis, Delfi, *Pinset* 107 (RNG); Island Poros, *Strid* 29680 (C); Mitilini, Lesbos, *Hansen* 4918 (C);

Valimiú, Peloponessos, *Hanson* 67-1-1 (RNG). ITALY. Basilicata, Potenza, *Akeroyd* 3328 (RNG); Gigerti, Agrigento, *Tavaliione* s.n. (C). MOROCCO. Fez, *Inocencio* 60016 (MUB); Khénichèt, *Inocencio* 60014 (MUB); Meknès, *Jury* 15502 (RNG); Sidi-Karcen, *Inocencio* 60017 (MUB). SPAIN. **Alicante:** Reservoir of Amadoiro, *Alcaraz* 48705 (MUB); La Algueña, Crevillente, *Inocencio & Alcaraz* 48683 (MUB). **Almería:** Santa María de Nieva, *David* 1017 (RNG); Níjar, *Inocencio & Alcaraz* 48712 (MUB); Berja, *Inocencio & Alcaraz* 48710 (MUB); Cañada de Vélez, Orce, *Inocencio & Alcaraz* 48714 (MUB); Las Cuadras de D. Pepe, Vélez Rubio, *Inocencio & Alcaraz* 48682 (MUB); Los Lobos, *Inocencio & Alcaraz* 48723 (MUB); Church of Saliente, Chirivel, *Inocencio & Alcaraz* 48713 (MUB); Huércal-Overa, *Inocencio & Alcaraz* 48728 (MUB); Serón, *Inocencio & Alcaraz* 48678 (MUB); Sierra de Gador, *Valdés* 813 (RNG). **Cádiz:** Jerez, *Inocencio & Alcaraz* s.n. (MUB); Sanlúcar, S. *Silvestre* 2524/68 (RNG). **Granada:** Castillejar, P. F. *Cannon* 692 (RNG); Malá, *Gardner* 1337 (RNG); Lanjarón, *Inocencio & Alcaraz* 48718 (MUB); Reservoir of Negratín, *Inocencio & Alcaraz* 48703 (MUB); Guadix, *Inocencio & Alcaraz* 48712 (MUB); Loja, *Inocencio & Alcaraz* 48681 (MUB); Baza, *Inocencio & Alcaraz* 48680 (MUB); Salobreña, *Inocencio & Alcaraz* 48717 (MUB). **Huesca:** Velilla de Cinca, *Inocencio & Alcaraz* 48688 (MUB). **Málaga:** Torre del Mar, *Inocencio & Alcaraz* 48688 (MUB); Vélez Málaga, *Inocencio & Alcaraz* 48719 (MUB). **Mallorca:** from Palma de Mallorca to Andraitx, *Inocencio & Alcaraz* 48726 (MUB). **Murcia:** Santa Cruz del Calvario, *Lange* s.n. (C); Murcia, *Lange* s.n. (C); Venta del Olivo, *Inocencio & Alcaraz* 48708 (MUB); Barinas, *Inocencio & Alcaraz* 48704 (MUB); Albudeite, *Inocencio & Alcaraz* 48709 (MUB); Lorea, *Inocencio & Alcaraz* 48722 (MUB); Yéchar, *Inocencio & Alcaraz* 48711 (MUB). **Jaén:** Alcaudete, *Inocencio & Alcaraz* 48721 (MUB); from Larva to Guadiana Menor, *Inocencio & Alcaraz* 48727 (MUB); Jódar, *Inocencio & Alcaraz* 48720 (MUB). **Sevilla:** Osuna, *Inocencio & Alcaraz* 48679 (MUB); S of Spain, J. W. *Carr* 20706.6 (RNG). SYRIA. Djebel Casioun, Damascus, *Sammuelsson* 1518 (K). TURKEY. Ankara, *Daris & Coode* 37217 (E); Dardanelles, s.n. (E); Denizli, K. *Hormia* 588 (RNG); Erzurum, Oltu, *Baytop* 14366 (E); Hakkari, Zab river, *Trelawny* 1305 (E); Keslitürkmenli, Mersin, *Hennipman* 1073 (RNG); Pamukkale, Denizli, *Baytop* 10231 (E); Saraycik-Osmancik, *Tobey* 2569 (E).

8b. *Capparis sicula* subsp. *herbacea* (Willd.)
Inocencio, D. Rivera, Obón & Alcaraz, stat. et comb. nov. Basionym: *Capparis herbacea* Willd., Enum. Pl.: 560, 1809. *Capparis ovata* var. *herbacea* (Willd.) Zohary, Bull. Res. Council Israel 8D: 56, 1960. TYPE: [Russia, Georgia or Azerbaijan] "Capparis herbacea, Marschall a Bieberstein. Habitat ad Caucasum" (lectotype, designated here, B!, unlabelled blossoming specimen, B-W, folder 10034, right of sheet 2).

Capparis herbacea Willd. var. *microphylla* Ledeb., Fl. Ross.: 235, 1842. *Capparis leucophylla* DC. var. *microphylla* (Ledeb.) Täckh. Students' Flora of Egypt, Ed. 2: 164, 1971. TYPE: [Kazakhstan or Turkmenistan] "Hab. ad litt. Orient.m. Caspii! *Karelin*" (holotype, LE not seen).

Shrub procumbent; twigs straight, sometimes reaching up to 3 m long, light green, herbaceous; internodes 1–3 cm; stipules straight, spreading, not

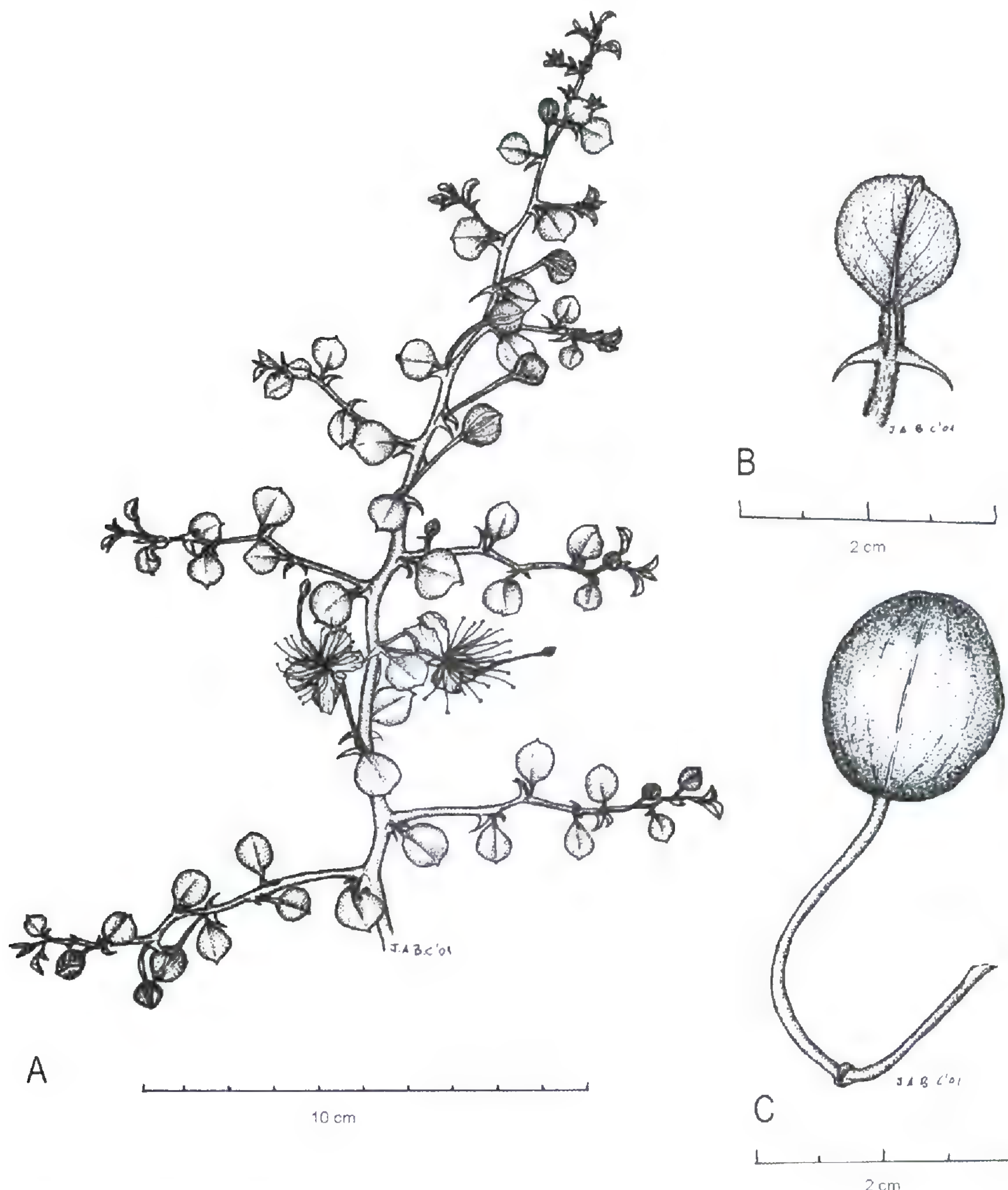


Figure 6. Details of the new subspecies *Capparis parviflora* subsp. *sphaerocarpa* Inocencio, D. Rivera, Obón, & Alcaraz. —A. Stems and flowers (drawn by J.-A. Barreña from *Furse* 5488, K). —B. Detail of leaf and stipules (drawn by J.-A. Barreña from *Nikitin & Ivanov s.n.*, E). —C. Fruit (drawn by J.-A. Barreña from *Hedge & Lamond* 37579, E).

decurrent, golden yellow, 0.3–0.6 cm long, 0.1–0.2 cm wide at the base. Leaves elliptic or oblong, 3–6 × 1.5–4 cm, herbaceous; indument lax, trichomes thin and short to long, 15–20 × 200–500 µm; leaf veins prominent; bases rounded, apices obtuse to acute; mucro small, 0.5–1 mm, curved; petioles short, 1–1.5 cm. Flower buds acute or rounded; floral pedicels thick and long, 4–6 cm; flowers zygomorphic; abaxial (odd) sepal helmet-shaped, 1.8–2.4 cm long, 0.6–1.2 cm deep; stamens 100 to 150, anthers 2.3–3 mm, with acute apices. Fruit obovate to oblong, pulp red; ripe seeds dark brown, 3–3.6 × 2.4–2.8 × 2–2.4 mm.

Note. Mongolian populations display stouter stipules and smaller leaves.

Illustrations. Takhtajan. (1966: 58, tab. 22).

Phenology. Flowering from May to September.

Distribution and habitat. Irano-Turanian Region extending to the Euro-Siberian. Middle East, Central Asia, and Caucasus [Afghanistan, Azerbaijan, Georgia, Iran, Kazakhstan, Mongolia, Turkey, Turkmenistan, Ukraine, Uzbekistan]. Stony places in calcareous soils and rocky grounds, slopes of low hills and walls of abandoned buildings, at elevations from 0 to 2000 m.

Selected specimens examined. AFGHANISTAN. Bamian, Darrah Siakar, *Hedge* 3423 (E); Den Hundie, *Edelberg* 1889 (C); Kundut, Khanabad, *Carter* 390 (K); Obek, Herat, *Hedge* W7777 (E); Samangan, *Hewer* 1128 (E); Takhar, Mughul, *Podlech* 11377 (E); Yawarzan, Badkshan, *Hedge* W9471 (E). AZERBAIJAN. Morghak, from Parsabad to Bileh Savar, *Lamond* 3097 (E). GEORGIA. S.I., *Frierk s.n.* (E); Caucasus, *Hohenanker s.n.* (E); Tbilisi, *Campbell* 175 (K). IRAN. Amol, *Andersen* 244 (E); Khvoy, *Cowan* 1560 (K); Mazandaran, Elburz, *Furse & Synge* 491 (K); Mianeh, *Bowles* 2423 (K); Moraweh Tappeh, *Hewer* H3804 (E); Sanganeh, Kopet Dagh,

Ghorashi-Al-Hosseni 495G (RGN). KAZAKHISTAN. Tchavto-gorozi Ioshnee sel. Tamerlanovski, *Priajin s.n.* (K). MONGOLIA. Tian-Shan, Mongolia, *Potanin s.n.* (K); Eastern Mongolia, Gobi, *Prezowski s.n.* (K). TURKEY. Artvin, Coruh, *Davis & Hedge D32427* (E); Hakkari, Kalolans, *Davis 23870* (E); Kagizman, *Watson 375* (K); Karabük, *Baytop 11383/65902* (E); Kars, *Davis 46680* (E) (K); Konya, Akyokus, *Dural 576* (E); Osmaniye, *Balls 1199* (K); Sinop, Kargi, *Tobey 2809* (E); Tokat-Niksar, *Davis 24882* (K); Zonguldak, Karabuk, *Davis & Coode D39050* (E). TURKMENISTAN. Ashgabat, *Freyn 260b* (E); Syr-Darja, *Golike s.n.* (K). UKRAINE. Krym, Yalta, *Toige 1896* (RNG). UZBEKISTAN. Altyn Tepe, Tashkent, 490 m. *Vasak s.n.* (K); Chavast, Samarkand, *Paulsen 277* (C).

There is a clear reference in the protologue to the Caucasus, which indirectly points to the specimens from this area in the herbarium Willdenow (surprisingly the protologue does not mention the Mussin-Pushkin expedition, *vid. infra.*). The reference in the protologue to a “*Capparis herbacea*. Marschall a Bieberstein” is presumably pointing to *Capparis ovata* M. Bieb. (Bieberstein, 1808, 1819). In the herbarium Willdenow (B) are two sheets within folder nr. 1003-I pertaining to *Capparis herbacea* (Hiepks, 1972). The folder is labelled: “Polyandria Monogynia/ *Capparis herbacea* foliis/ subrotunde ellipticis ovalis/ axillis spinosis. Pedunculis/ unifloris/ Habitat Caucasus.” Sheets 1 and 2 are numbered and annotated both as follows: “*C. herbacea*” and “W.” The folder has two other labels: “Mussin Pushkin/ W.” This refers to Count Apollo Apollosovich Mussin-Pushkin (1760–1805), who was a Russian explorer and plant collector. He led a botanical expedition to the Caucasus in 1800–1802. The other label is almost illegible. It is not clear whether the specimen was originally collected in the Caucasus by Mussin-Pushkin or, presumably, cultivated in the Royal Botanic Garden of Berlin from seeds gathered by this collector (the species is published in a catalog of plants actually grown at Berlin). This species was, in fact, cultivated in another botanic garden in Saint Petersburg: “*Cultam in tepidario saepe fruticosam fieri et C. spinosae assimilari nunciat Fischer in litteris*” [Friedrich Ernst Ludwig von Fischer was director of the Imperial Botanic Garden of Saint Petersburg (Pritzel, 1872)] (Bieberstein, 1819).

8c. *Capparis sicula* Veill. subsp. *leucophylla* (DC.)
Inocencio, D. Rivera, Obón & Alcaraz, stat. et comb. nov. Basionym: *Capparis leucophylla* DC., Prodr. Vol. I: 246. 1824. TYPE: [Iraq] “Inter Bagdad et Alep. *Oliv. et Brug.* (v.s. in Herb. Mus. Par.)” (lectotype, designated here, P!).

Capparis spinosa L. var. *pubescens* Zohary, Bull. Res. Council Israel 8D: 56. 1960. TYPE: [Egypt] Galala, rocks, 4100 ft., 1944, *P. H. Davis 8062* (holotype, K!).

Shrub procumbent; twigs straight, semi-erect, sometimes reaching up to 3 m long, glaucous; internodes 1.5–5 cm; stipules curved, retrorse, not decurrent or somewhat decurrent, golden yellow, 0.3–0.6 cm long, 0.1–0.3 cm wide at the base. Leaves elliptic to rounded, sometimes ovate, 2.5–4.5 × 2–3.5 cm, herbaceous; indument very dense, whitish, trichomes thin and long, 20–25 × 200–500 µm; leaf veins not prominent; bases rounded, apices obtuse or acute; mucro long, 1–1.5 mm, straight or somewhat curved; petioles short, 0.5–1 cm. Flower buds rounded or acute; floral pedicels thick and short, 2.5–3.5 cm; flowers zygomorphic; abaxial (odd) sepal galeate, 1.5–2.2 cm long, 0.7–1.1 cm deep; stamens 100 to 150, anthers 3.5–4 mm, with acute apices. Fruit oblong, pulp red; ripe seeds dark brown, 2.7–3 × 2.6–2.8 × 1.8–2 mm.

Illustrations. Mandaville (1990: pl. 69–70).

Phenology. Flowering from May to September.

Distribution and habitat. Irano-Turanian and Saharo-Arabian Regions. North Africa, Middle East into Pakistan [Afghanistan, Iran, Iraq, Israel, Pakistan, Saudi Arabia, Yemen]; also in Egypt (Zohary, 1960). Oasis in semi-deserts, flooding plains, sometimes in somewhat saline soils; at elevations from 0 to 1000 m.

The sheet with the lectotype of *Capparis leucophylla* is labelled: I “*Capparis leucophylla* DC/ (De Candolle Script.)” II “de Bagdad à Alep./ Olivier de Bruguere” III “Herb. Mus. Paris./ *Capparis leucophylla* DC.” The coincidence between labels and references to type material in the protologue led us to suppose Candolle was implicitly designating a holotype, provided the author used only one element.

Selected specimens examined. AFGHANISTAN. Baghlan, SW of Doshi, *Hewer 1153* (K); Morghak, *Furse 7735* (K). IRAN. Bam, *Leonard 6052* (K); Kerman, *Parris 75405* (E); Rudak, [= Dehbarek], *Davis & Bokhari D. 56505* (E). IRAQ. Hamah, *Karin & Noori 39981* (K); Tell Kotchek-Senonal. Mosul-Liwa, *J. B. Gillet 10846* (K); Southern Desert, S. of Al Salman, *Ravi, Agnew & Haines 1656* (E); Shaikhiya, Salma-Samawa, *Al-Shehbaz s.n.* (RNG). ISRAEL. Gilboa mountain, *Davis 4668* (E). JORDAN. Jordan *M.E.D.P. S/1113* (K). PAKISTAN. Chitral, Tirich, *Stainton 2780* (E). SAUDI ARABIA. Rumah, *White 73* (K). YEMEN. Huth, *Miller 3156* (E); Sanaa, *Miller 3401* (E).

8d. *Capparis sicula* Veill. subsp. *mesopotamica*
Inocencio, D. Rivera, Obón & Alcaraz, subsp. nov. TYPE: [Iraq] “Amara, 9 Sep. 1918, *W. Edgar Evans, M/100* (E)” (holotype, designated here, E!, specimen E 65908). Figure 7.

Indumentum trichomatibus brevioribus, 100–250 µm longis, et tenuioribus, 15–20 µm latis, internodiis aculeis ad basim tenuioribus, 0.1–0.2 cm, pedicelis brevioribus, 3–4.5 cm, a typo differt.

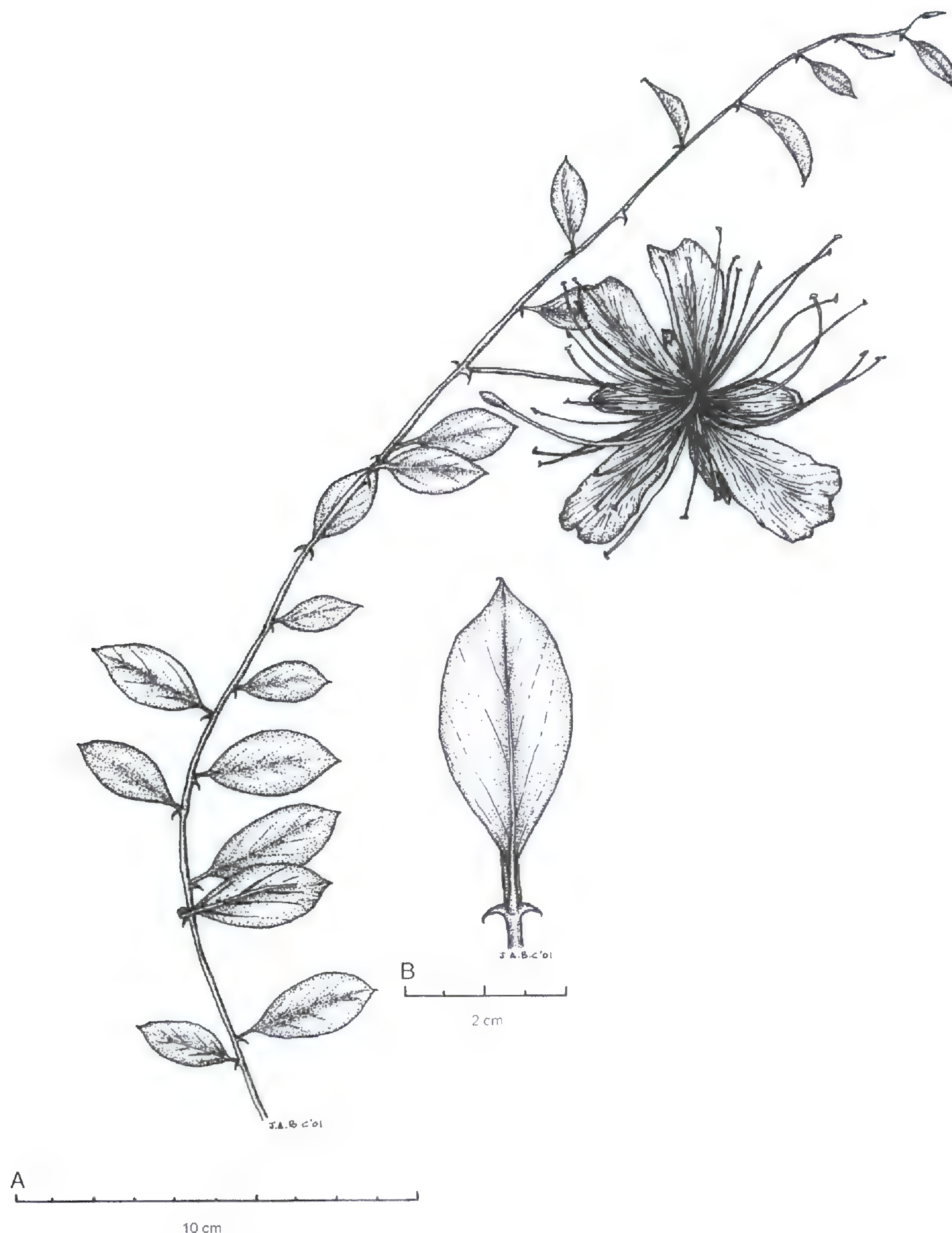


Figure 7. Details of the new subspecies *Capparis sicula* subsp. *mesopotamica* Inocencio, D. Rivera, Obón, & Alcaraz. —A. Stem and flower. —B. Detail of leaf and stipules. (A, B drawn by J.-A. Barreña from *Furse* 9021, K.)

Shrub procumbent; twigs straight, up to 2 m long, yellowish green; internodes 0.5–3.5 cm; stipules curved, retrorse, not decurrent, yellow-orange, 0.2–0.4 cm long, 0.1–0.2 cm wide at the base. Leaves obovate or oblong, $2.2\text{--}3.5 \times 1.3\text{--}2.5$ cm, herbaceous; indument very lax, trichomes thin and short, $100\text{--}250 \times 15\text{--}20$ μm ; leaf veins prominent; base acute, apices acute or rounded; mucro long, 1–1.5 mm, straight; petioles short, 0.5–0.7 cm. Flower buds rounded or slightly acute; floral pedicels slender and short, 3–4.5 cm; flowers zygomorphic; abaxial (odd) sepal galeate, 1.2–1.8 cm long, 0.6–0.8 cm

deep; stamens 100 to 150, anthers 2–2.5 mm, with acute apices. Fruit oblong, pulp red; ripe seeds brown, $2.8\text{--}3 \times 2.4\text{--}2.8 \times 1.7\text{--}2$ mm.

Illustrations. Townsend & Guest (1980: pl. in front of the title page).

Phenology. Flowering and fruiting from July to September.

Distribution and habitat. Irano-Turanian Region. Extending somewhat into the Mediterranean and Saharo-Arabian Regions. Middle East [Iran, Iraq, Israel, Syria]. Sandstone, often near orchards and groves, at elevations from 0 to 2300 m.

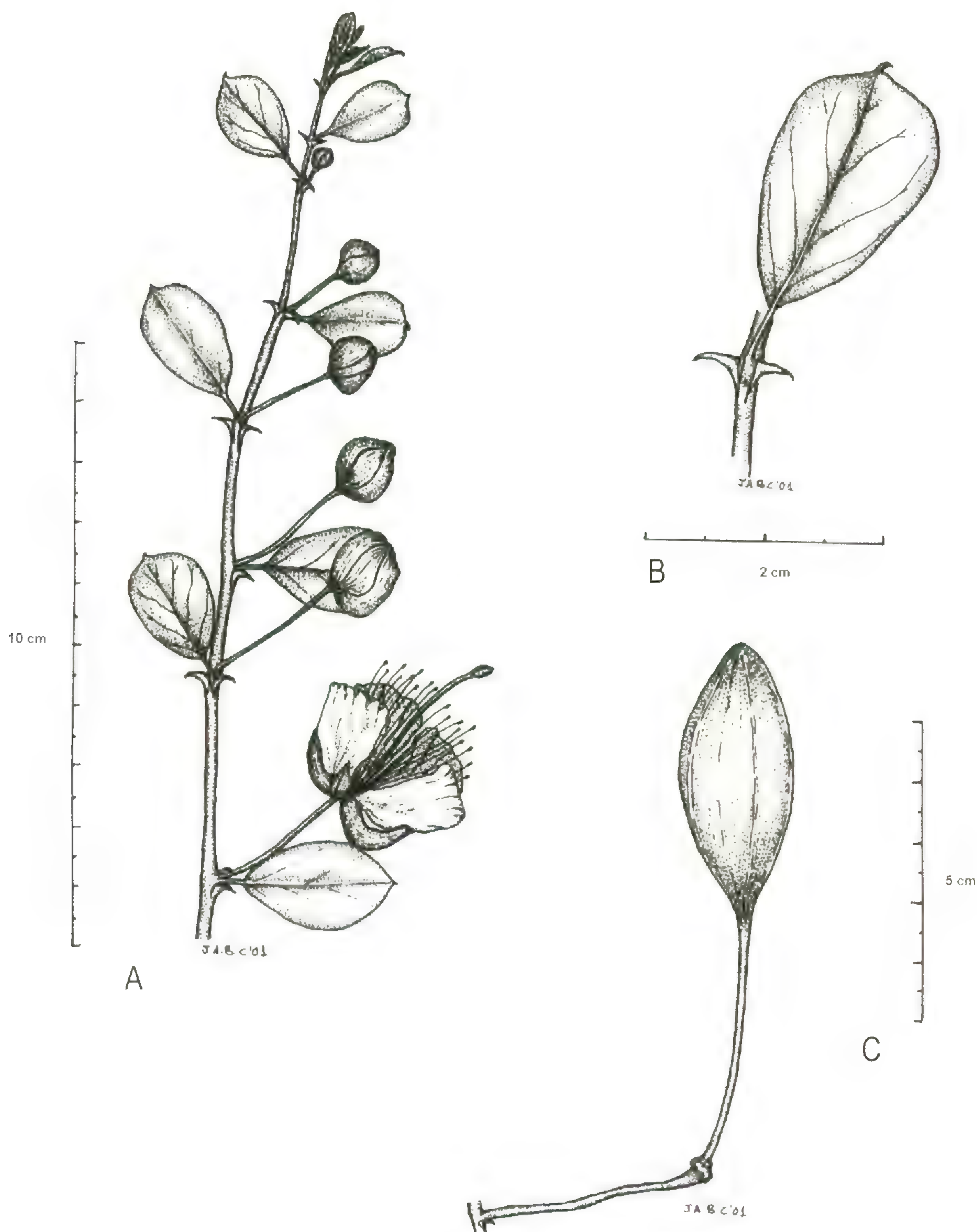


Figure 8. Details of the new subspecies *Capparis sicula* Veill. subsp. *sindiana* Inocencio, D. Rivera, Obón & Alcaraz. —A. Stem and flower. —B. Detail of leaf and stipules. —C. Fruit. (A–C drawn by J.-A. Barreña from *Lulman* 92, K.)

Paratypes. IRAN. Gulestan, *Furse* 9021 (K); Másjed-e-Saleyman, *Lee* 68 (K); Mazanderan, Tehran, *s.n.* 10530 (E). IRAQ. Amara, *Edgar Evans M/100* (E); Saádiya, *Al-Kaisi* 42894 (K); Sirk, Garmah, *R. Wheeler* 322 (E). ISRAEL. Mizde Dragot, Dead Sea, *Danin & Knees* 342 (RNG). SYRIA. Am Dara, *Rivera & Obón s.n.* (MUB).

8e. *Capparis sicula* Veill. subsp. *sindiana* Inocencio, D. Rivera, Obón & Alcaraz, subsp. nov.
TYPE: [Afghanistan] Barak, 26 Aug. 1986, *Mr. Lulman*, 92 (holotype, K!). Figure 8.

Capparis obovata Royle, Illinois Bot. Himal. Mts. Vol. I: 73. 1839. TYPE: [Himachal Pradesh, India] "Hab. Hango [Chango] in Kunawur [Kinnaur, Kinawur]" (type not seen).

Caulibus viridescens vel luteis, trichomatibus laxis, pedunculis floralibus gracillimis brevioribus, a typo differt. Stipulis aureis, antheris minutis a subspecie mesopotamica differt.

Shrub procumbent, almost glabrous; twigs straight, sometimes reaching up to 3 m long, light green or yellowish; internodes 1–3 cm; stipules curved or somewhat curved, retrorse, occasionally spreading, not decurrent to somewhat decurrent, golden yellow contrasting with the twigs, 0.1–0.4 cm long, 0.1–0.2 cm wide at the base. Leaves obovate or elliptical, 1–3.5 × 1–3 cm, herbaceous; leaf veins prominent; base rounded, apices acute; mucro very small,

0.1–0.5 mm, straight or slightly curved; petioles short, 0.3–1 cm. Flower buds acute; floral pedicels slender, short, 1.5–4 cm; flowers zygomorphic; abaxial (odd) sepal galeate, 0.8–1.2 cm long, 0.4–0.6 cm deep; stamens 100 to 150, anthers 1.6–2 mm, with acute apices. Fruit ellipsoidal to oblong, pulp red; ripe seeds dark brown, $2.8\text{--}2.6 \times 2.4\text{--}2.6 \times 1.8\text{--}2$ mm.

Illustrations. Royle (1839: 73); Narvi & Ali (1973: 8, fig. 2a); Polunin & Stainton (1984: pl. 16, n. 161).

Phenology. Flowering from July to September.

Distribution and habitat. Sudano-Zambezian, Indian and Irano-Turanian Regions. Middle East into India [Afghanistan, India, Pakistan]. Walls, meadows, and human dwellings; from 1000 to 3000 m.

In the lower left-hand part of the sheet with the holotype of *Capparis sicula* Veill. subsp. *sindiana* at K is a label with the following script: “FLORA OF AFGHANISTAN N. 92 / Name. *Capparis spinosa* L. / Native Name: Barak: dry riverbed. shale / Locality & Altitude: / sunny widespread growth. straggling, / Notes: procumbent stems. Fruit when ripe / dehisces along 3 lines to open out as / mass of bright red sticky fluid seeds / embedded in latter / alt. 1430 m. / Collector: Mr Lulman / Date: 26.8.1968.”

The John Forbes Royle Herbarium is at LIV; however, Donna Young (pers. comm.) has checked in the Roylean herbarium and verified that no type specimen for *Capparis ovata* is there. Other herbaria where possible original material may be (DD and K) were unsuccessfully contacted. Therefore a neotype is necessary.

Paratypes. AFGHANISTAN. Barak, Lulman 92 (K). INDIA. Wangtu to Sholtu, Cholto bridge, Bashahr, Punjab, Lace 178 (E); Li. Bushahr, Simla, Eastern Punjab, Parmanand 725 (E). PAKISTAN. Balti, Iskalkoo, Winterbottom s.n. (K); Gaud nullah, Gupis, Gilgit, Karachi, Omer 266 (E); Gilgit-Karimabad, 1500 m, Qaiser, Omer & Husain 8444 (RNG); Kharipur, Jafri 2421 (E); Shardu, Baltistan, Shah 249 (E); above the Indus river, Shardu, Kashmir, Baltistan, 2600 m, Webster & Nasir 5771 (K).

9. *Capparis spinosa* L., Sp. pl.: 503. 1753. TYPE: [France?] “Habitat in Europae australis arenosis, ruderalis” (lectotype, designated by Burt & Lewis in Kew Bull. 4: 299. 1949, BM, Herb. Clifford: 203!, *Capparis* No. 912.348–50, validated by Jacobs, Blumea 12/3: 417. 1965).

Capparis peduncularis Presl., Delic. Prag.: 20–21. 1822.

Shrub procumbent; twigs straight, sometimes reaching up to 3 m, dark green; internodes 1.5–3.5 cm; stipules curved, retrorse, not decurrent, slender, weak or vestigial, rarely strong, usually very long and thin,

dark yellow, 0.3–0.6 cm long, 0.1–0.2 cm wide at the base. Leaves ovate or obovate, $4\text{--}5 \times 2.5\text{--}3.5$ cm, herbaceous; indument very lax, trichomes thick and long, $25\text{--}40 \times 300\text{--}500$ μm , early falling; leaf veins not prominent; base rounded or somewhat tapering, apices acute; mucro very small, 0.1–0.5 mm, straight; petioles short, 0.7–1 cm. Flower buds acute; floral pedicels thick and long, 5–6.5 cm; flowers zygomorphic; abaxial (odd) sepal galeate, 1.8–2.4 cm long, 0.6–1.1 cm deep; stamens 100 to 150, anthers 2.5–2.8 mm, with acute apices. Fruit oblong, pulp red; ripe seeds brown, $3\text{--}3.2 \times 2.6\text{--}2.8 \times 2\text{--}2.5$ mm.

Illustrations. Coste (1900: 142); Woodville (1794: plate 228, drawn and engraved by James Sowerby).

Phenology. Flowering from May to October.

Distribution and habitat. Mediterranean Region. Mediterranean Europe, Middle East into Turkey [France, Greece, Italy, Spain, Turkey]. Cultivated, sometimes found in secondary habitats as a feral or living among the parental species, at elevations from 0 to 250 m. Figure 2.

Rivera et al. (2006) reviewed the status and typification of *Capparis spinosa*. In summary, morphological, reproductive, and molecular data suggest, but do not prove, that this is a hybrid species kept in cultivation. The origins of the different populations are related to the coincidence of wild and/or cultivated individuals in proximity, belonging to *C. sicula* and *C. orientalis*, especially in the Western Mediterranean [Sicily, Mallorca], but also in Greece. The diversity within this crop shows a pattern of variation intermediate between the putative parentage (Rivera et al., 1999).

Selected specimens examined. FRANCE. Montpellier, Benthams 243 (E); s.l. Agardh. s.n. (C). GREECE. Rhodes, Sandermann s.n. (C); Periol Botanical Garden (unknown), Lasfeu s.n. (C). ITALY. Sicily, Agrigento, Davis 40229 (RNG); Stromboli, B. Larsen s.n. (C). SPAIN. **Alicante:** El Campello, Inocencio & Alcaraz s.n. (MUB); Paraiso Beach, Villajoyosa, Hewat H 1040 (RNG). **Barcelona:** Barcelona, Sennen 1587 (RNG). **Cordoba:** El Templete, C. López CL1971/86 (RNG). **Mallorca:** Banyalbufar, Inocencio & Alcaraz s.n. (MUB); Campanet Caves, Inocencio & Alcaraz s.n. (MUB); from Santa Maria to Inca, Inocencio & Alcaraz s.n. (MUB); Valldemosa, Christensen 1372 (C). TURKEY. Denizli, Hänel 00.437 (E); Eskisehir-Sündihen, Ehim 373 (E).

10. *Capparis zoharyi* Inocencio, D. Rivera, Obón & Alcaraz, sp. nov. TYPE: [Spain] “El Llano del Beal, Murcia, Spain, 7 July 1999, Inocencio 42689” (holotype, designated here, UMH!; paratypes, Inocencio & Alcaraz 70102, 70103, 48689, sent to K, E, and MO!). Figure 9.

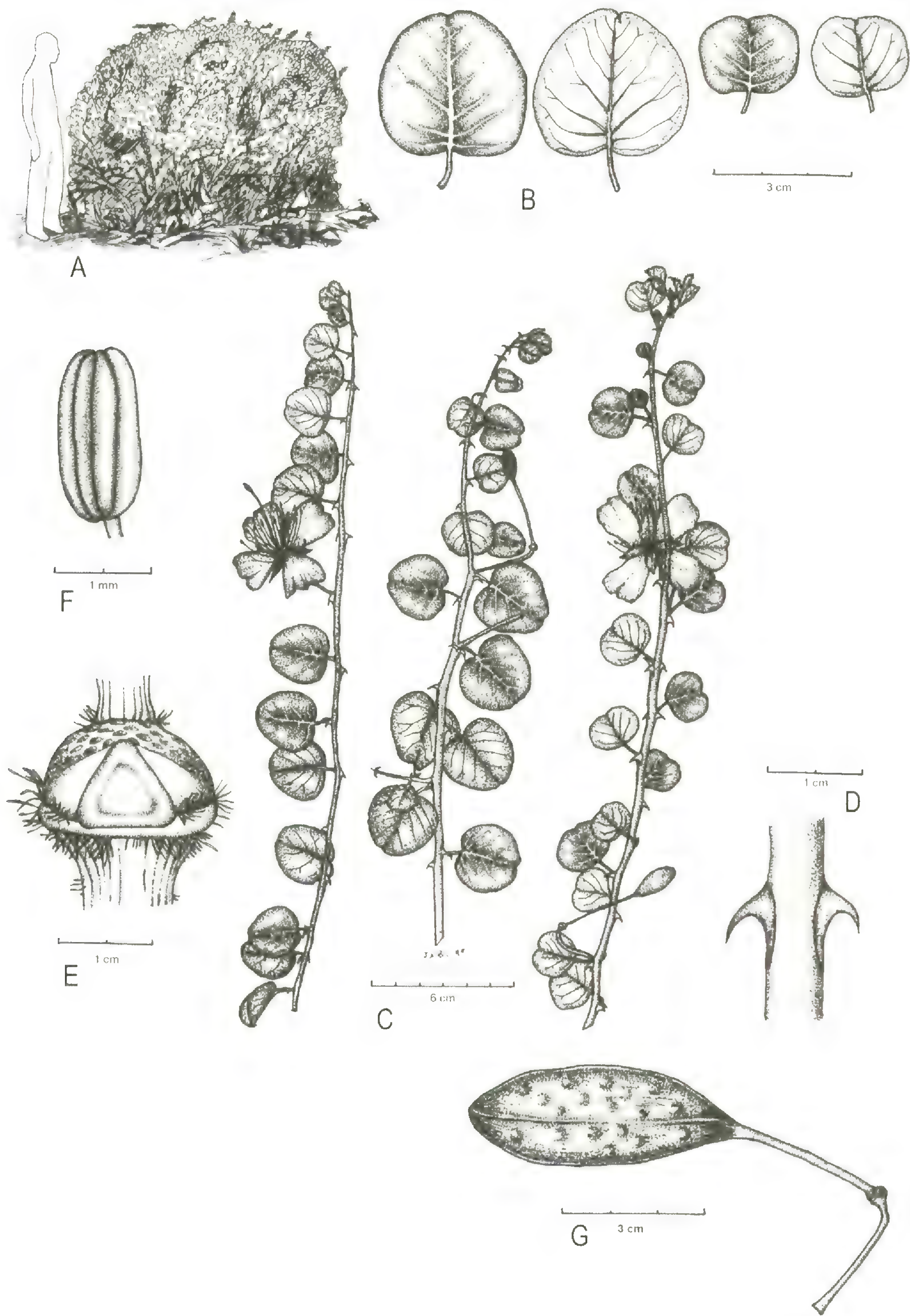


Figure 9. Details of the new species *Capparis zoharyi* Inocencio, D. Rivera, Obón & Alcaraz. —A. Habit. —B. Detail of leaf variability. —C. Stems. —D. Detail of the stipules. —E. Detail of nectary. —F. Detail of anther. —G. Fruit. (A–G drawn by P. Perales & J.-A. Barreña from Inocencio & Alcaraz 18689.)

Frutices erecti, usque ad 2 m; stipulis decurrentibus, similibus rosaris; foliis rotundis-obcordatis, rarius ovatis, (2–4 cm longis, 2–4 cm latis), apice emarginatis vel obtusis a *Capparis aegyptia* differt. In memoriam Michaelis Zohary dicata.

Shrub erect, glabrous; twigs straight, $\pm$ erect, up to 2 m long, green to reddish purple, older twigs bluish due to a waxy covering; internodes 1–5 cm; stipules curved, retrorse, strongly decurrent, rose type, orange, 0.3–0.6 cm long, 0.3–0.4 cm wide at the base. Leaves rounded to obcordate, rarely ovate, 2–4 $\times$ 2–4 cm, somewhat fleshy; leaf veins not prominent; base rounded, sometimes cordate, apices rounded or slightly obcordate; mucro absent or very small, 0.1–0.5 mm; petioles short, 0.7–1 cm. Flower buds rounded; floral pedicels thick and long, 3–5 cm; flowers slightly zygomorphic; abaxial (odd) sepal slightly galeate, 1.5–1.7 cm long, 0.6–0.9 cm deep; stamens 30 to 80, anthers 1.3–1.5 mm, with round apices. Fruit oblong, pulp yellow; ripe seeds brown, 3.4–3.8 $\times$ 3–3.2 $\times$ 2–2.2 mm.

Illustrations. Figure 14 in Zohary (1966: 358).

Phenology. Flowering and fruiting from March to October.

Distribution and habitat. Mediterranean Region. Mediterranean Europe, North Africa, Middle East into Turkey [Algeria, Egypt, Greece, Israel, Jordan, Lebanon, Morocco, Spain, Syria, Turkey]. Walls, rocks, pronounced slopes, at elevations from 0 to 200 m, often in the vicinity of human dwellings. Figure 4.

Paratypes. ALGERIA. Chiffa, Blida, *Davis* 59527 (E). EGYPT. S.I., *N. Tadmor & A. Shmida* S-420 (E); Sinai, *Boré* 273 (K). GREECE. Samos, *W. Barbey* 653 (E). SPAIN. **Murcia:** El Llano del Beal, *Alcaraz, Rivera & Obón* 48733 (MUB). ISRAEL. Ein Gedi, *O. B. Lyschede* 9/99/71 (C); Kfar Gileh y Manara, *Curle* 65 (K); Manara, *C. M. Curle* 143 (E); Mount Gilboa, *Davis* 4667 (E); Wadi Qelt, *Davis* 3651 (E); Wadi Yarmuk, *Davis* 4604 (E). JORDAN. South of Rum Rest House, *Jallad et al.* 7636 (E); Wadi Mujib, Ma'daba, *L. Boulos* 5856 (K). LEBANON. Beirut, *s.n.* (E). MOROCCO. Safi, 20 June 1999, *Inocencio* 60025 (MUB). SYRIA. Am Dara, *Rivera & Obón* 60049 (MUB); Damascus, *Rivera & Obón* 60048 (MUB); Maaraba, *Rivera & Obón* 60046 (MUB); Palmyra, *Rivera & Obón* 60051 (MUB); Ugarit, *Rivera & Obón* 60045 (MUB). TURKEY. Adana, *E. K. Balls* 119 (E); Alanya, *Baytop* 9701 (E); Antalya, *Smith* 4 (K).

DISCUSSION

This paper introduces changes in the *Capparis* sect. *Capparis* taxonomy adopted by authors such as Zohary (1960), who organized the diversity within this section around two core species, viz. *Capparis spinosa* and *C. ovata*. Most of the endemic taxa that previously were subordinated to one or the other of the above species

at the rank of variety or subspecies have been here recognized as species or subspecies. One of the reasons for the synthetic approach of Jacobs (1965) or Zohary (1960) is the relative frequency of intermediate individuals in herbarium specimens that obscure the clear distinction among species. We refer to most of these as hybrid individuals, as revealed by our fieldwork in the Iberian Peninsula and North Africa (Inocencio, 2001).

Hybrids have been reported from different areas in which presumably hybrid swarms occur between two different *Capparis* species growing together. Hybrids are frequent in Iraq and neighboring countries of the Near East (Blakelock & Townsend, 1980), shadowing the distinction between species. The most relevant interspecific hybrid, for its economic uses, is *C. spinosa*, which is also the type “species” of the genus. It occurs spontaneously in populations of *C. orientalis* growing close to those of *C. sicula* in the western Mediterranean (Inocencio, 2001). Only this nothotaxon has been widely taken into cultivation. There have been no reported intersectional hybrids within *Capparis* subgenus *Capparis*, although *Capparis ovata* subsp. *myrtifolia* seems to be an intermediate between *C. ovata* subsp. *ovata* and *C. inermis* and, therefore, presumably their hybridogen. *Capparis ovata* is here restricted to the Algerian type and those populations closely related in morphology that extend from Morocco to Chad.

The large complex of Mediterranean and Irano-Turanian taxa formerly subordinated to *Capparis spinosa* is here combined under *C. sicula* because this is the name available according to the principle of priority.

Literature Cited

- Ali, S. & S. Jafri. 1977. Capparaceae. Pp. 1–20 in S. Jafri & S. Ali (editors), *Flora of Libya*, Vol. XII. Al Faateh University, Tripoli.
- Anonymous. 2005. CBD Strategy and Action Plan—Tajikistan, Part IV [English version]. <<http://www.biodiv.org/doc/world/tj/tj-nbsap-01-p04-en.pdf>>.
- Bauhin, J., J. Cherler & D. Chabrey. 1651. *Historia plantarum universalis*, Vol. II. Yverdon.
- Benchelah, A. C., H. Bouziane, M. Maka & C. Ouahes. 2000. *Fleurs du Sahara*. Ed. Ibis Press, Paris.
- Bentham, G. & J. D. Hooker. 1862. *Genera plantarum*, Vol. I. Reeve, London.
- von Bieberstein, M. A. 1808. *Flora Taurico-Caucasica*, Vol. II. Typis Academicis, Charkouiae.
- . 1819. *Flora Taurico-Caucasica*, Vol. III. Suppl. Typis Academicis, Charkouiae.
- Blakelock, R. A. & C. C. Townsend. 1980. Capparidaceae. Pp. 139–145 in C. C. Townsend & E. Guest (editors), *Flora of Iraq*, Vol. IV, Part I. Ministry of Agriculture & Agrarian Reform, Baghdad.

- Bobrov, E. G. 1939. Capparidaceae. Pp. 1–14 in V. L. Komarov (editor), Flora S.S.S.R., Vol. VIII. Izdate'stvo Akademii Nauk SSSR, Leningrad-Moscow.
- . 1970. Capparidaceae. Pp. 3–13 in V. L. Komarov (editor), Flora of the U.S.S.R., Vol. VIII. Israel Program for Scientific Translations, Jerusalem.
- Boccone, P. 1674. Icon. et descript. Rarior. Plantar. Sicil. Melitae, Juliae et Italiae. Theatro Sheldoniano, Oxford.
- Bocquet, G. & D. Aeschiman. 1981. Une modification de la classification des formes biologiques d'Ellenberg & Mueller-Dombois. *Candollea* 36: 271–278.
- Candolle, A. P. de. 1824. *Capparis*. Pp. 245–254 in *Prodromus systematis naturalis regni vegetabilis*, Vol. 1. Treuttel et Würtz, Paris.
- Castroviejo, S., M. Laínz, G. López González, P. Monserrat, F. Muñoz Garmendia, J. Paiva & L. Villar. 1993. Flora Ibérica. Vol. III. CSIC, Madrid.
- Charco, J. 2001. Guía de Árboles y Arbustos del Norte Africa. Ediciones Cultura Hispánica, Madrid.
- Coste, H. 1900. Fl. descr. France. Vol. I. Paul Klincksieck, Paris.
- Cummings, M. P., J. M. Nugent, R. G. Olmstead & J. D. Palmer. 2003. Phylogenetic analysis reveals five independent transfers of the chloroplast gene *rbcL* to the mitochondrial genome in angiosperms. *Curr. Genet.* 43: 131–138.
- Delile, A. 1812. Description de l'Égypte, Histoire Naturelle. 2. Imprimerie Imperiale, Paris.
- Duhamel, H. L. 1801. Traité des Arbres et Arbustes. Ed. 2. Vol. 1. Paris.
- Fedtschenko, B. & O. Fedtschenko. 1906. Conspectus Flora Turkestanica. *Beih. Bot. Centralbl.* 20: 297–396–341.
- Fici, S. 2001. Intraspecific variation and evolutionary trends in *Capparis spinosa* L. (Capparaceae). *Pl. Syst. Evol.* 228: 123–141.
- Fragman, O., R. Levy & P. Christodoulou. 2001. Flowers of the Eastern Mediterranean. Ruppell, A.P.G., Gertner.
- Graham, J. 1839. Cat. Pl. Bombay. The Government Press, Bombay.
- Greuter, W., H. Burdet & G. Long. 1984. in *Med-Checklist*, Vol. I. Conservatoire et Jardin Botaniques de la Ville de Genève, Geneva.
- Guerau, C. & N. Torres. 1981. Nova Aportació al coneixement de les plantes d'Eivissa i Formentera. Institut d'Estudis Eivissencs, Ibiza.
- Hall, J. C., K. J. Sytsma & H. H. Iltis. 2002. Phylogeny of Capparaceae and Brassicaceae based on chloroplast sequence data. *Amer. J. Bot.* 89: 1826–1842.
- Hiepks, P. 1972. Herbarium Willdenow. Alphabetical Index Museum Botanicum Berolinense. IDC, Ag Zug.
- Higton, R. N. & J. R. Akeroyd. 1991. Variation in *Capparis spinosa* L. *Bot. J. Linn. Soc.* 106: 104–112.
- Inocencio, C. 2001. Caracterización de *Capparis* subgénero *Capparis* (Capparaceae). Universidad de Murcia, Murcia, (Ph.D. Thesis.)
- , D. Rivera, F. Alcaraz & F. Tomás-Barberán. 2000. Flavonoid content of commercial capers (*Capparis spinosa*, *C. sicula* and *C. orientalis*). *Eur. Food Res. Technol.* 212: 70–74.
- , F. Alcaraz, F. Calderón, C. Obón & D. Rivera. 2002. The use of floral characters in *Capparis* sect. *Capparis* to determine the botanical and geographical origin of capers. *Eur. Food Res. Technol.* 214: 335–339.
- , R. Cowan, C. Rivera, F. Alcaraz, F. Fay & M. 2005. AFLP fingerprinting in *Capparis* L. subgenus *Capparis* (Capparaceae) related to the commercial sources of capers. *Genet. Resources & Crop Evol.* 52: 137–144.
- Jacobs, M. 1965. The Genus *Capparis* from the Indus to the Pacific. *Blumea* 12(3): 385–541.
- Jarvis, C. E., R. Barrie, D. M. Allan & J. L. Reveal. 1993. A List of Linnaean Generic Names and Their Types. Koeltz, Königstein.
- Lack, W. 1997. The Sibthorpian Herbarium at Oxford—Guidelines for its use. *Taxon* 46: 253–263.
- Lamarck, J. B. 1783. *Encycl. Method. Bot.* Vol. I. Panckoucke, Paris.
- Lewalle, J. & N. Montfort. 1997. *Fleurs Sauvages du Maroc*. TZ-Verlagsgesellschaft, Rossdorf.
- Linnaeus, C. 1753. *Species Plantarum*. Stockholm.
- . 1754. *Genera Plantarum*. Stockholm.
- Lonicer, A. 1679. *Kreuterbuch*. Ulm.
- Mandaville, J. 1990. Fl. Eastern Saudi Arabia. National Commission for Wildlife Conservation, Riyadh.
- Migahid, C. A. M. 1988. Flora of Saudi Arabia. 3rd Ed. I. K. S. University, Riyadh.
- Narvi, M. & S. Ali. 1973. Fl. West Pakistan. Vol. XXXIV. University of Karachi, Rawalpindi.
- Olivier, G. A. 1801–1807. Voyage dans l'Empire Othoman, l'Égypte et la Perse, fait par ordre du gouvernement pendant les six premières années de la République. 3 Vols., H. Agasse, Paris.
- Ozenda, P. 1991. Fl. Sahara. Éditions du CNRS, Paris.
- Plitmann, U., C. Heyn, A. Danin & A. Shmida. 1983. Pictorial Flora Israel. Massada, Tel Aviv.
- Pollunin, O. & A. Stainton. 1984. Flowers of the Himalaya. Oxford Univ. Press, Delhi.
- Pritzel, G. A. 1872. *Thesaurus Literaturae Botanicae*. Brockhaus, Leipzig.
- Rivera, D., F. Alcaraz, C. Inocencio, C. Obón & E. Carreño. 1999. Taxonomic study of cultivated *Capparis* sect. *Capparis* in the western Mediterranean. Pp. 451–455 in S. Andrews, A. C. Leslie & C. Alexander (editors), *Taxonomy of Cultivated Plants: Third International Symposium*. Royal Botanic Gardens, Kew.
- , C. Inocencio, C. Obón, E. Carreño, A. Reales & F. Alcaraz. 2002. Archaeobotany of capers (*Capparis*) (Capparaceae). *Veg. Hist. Archaeobot.* 11: 295–313.
- , I. Friis, C. Inocencio, C. Obón, F. Alcaraz & A. Reales. 2003a. The typification of *Capparis inermis* Forssk., *C. sinaica* Veill. and *C. cartilaginea* Decne. (Capparaceae). *Taxon* 52: 307–311.
- , C. Inocencio, C. Obón & F. Alcaraz. 2003b. Review of Food and Medicinal Uses of *Capparis* L. subgenus *Capparis* (Capparidaceae). *Econ. Bot.* 57: 515–534.
- , ———, ———, A. Reales & F. Alcaraz. 2006. *Capparis spinosa* L. (Capparaceae): The application of the name after study of the lectotype and typification of *C. sicula* Veill. and *C. orientalis* Veill. *Taxon*. (in press).
- Rodman, J. E., P. S. Soltis, D. E. Soltis, K. J. Sytsma & K. G. Karol. 1998. Parallel evolution of glucosinolate biosynthesis inferred from congruent nuclear and plastid gene phylogenies. *Amer. J. Bot.* 85: 997–1006.
- Royle, J. F. 1839. Ill. bot. Himal. Mts., Vol. I. W. H. Allen, London.
- Smith, J. E. 1825. *Flora Graeca*, Vol. V. Richard Taylor, London.
- Stafleu, F. & R. S. Cowan. 1976. *Taxonomic Literature*, Vol. I: A–G. *Regnum Veg.* 94: 1–1136.
- & ———. 1979. *Taxonomic Literature*, Vol. II: H–L. *Regnum Veg.* 98: 1–991.
- & ———. 1981. *Taxonomic Literature*, Vol. III: Lh–O. *Regnum Veg.* 105: 1–980.

-
- & ———. 1983. Taxonomic Literature, Vol. IV: P–Sak. *Regnum Veg.* 110: 1–1214.
- & ———. 1985. Taxonomic Literature, Vol. V: Sal–Ste. *Regnum Veg.* 112: 1–1066.
- & ———. 1988. Taxonomic Literature, Vol. VII: W–Z. *Regnum Veg.* 116: 1–653.
- Täckholm, V. 1974. Students' Fl. Egypt. Cairo University, Beirut.
- Takhtajan, A. 1966. *Flora Armenii*, Vol. V. Akademii Nauk Armianskoj SSR, Erevan.
- . 1986. *Floristic Regions of the World*. Univ. California Press, Berkeley.
- Townsend, C. C. & E. Guest. 1980. *Fl. Iraq*, Vol. IV(I). Ministry of Agriculture and Agrarian Reform, Baghdad.
- Valdés, B., S. Talavera & E. Fernández. 1987. *Fl. Andalucía Occidental*, Vol. I. Ketres, Barcelona.
- Vavilov, N. I. 1931. Linnaeus species as a system. *Trudy Prikl. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl. Breed.)* 26(3): 109–134.
- Willis, J. C. 1988. *A Dictionary of the Flowering Plants and Ferns*. Eighth Edition. Cambridge Univ. Press, Cambridge.
- Woodville, W. 1794. *Medical Botany*. James Phillips, London.
- Zohary, M. 1960. The species of *Capparis* in the Mediterranean and the Near Eastern Countries. *Bull. Res. Council Israel*. 8D: 29–64.
- . 1966. *Fl. Palaestina*. Vol. I. Plates. The Israeli Academy of Sciences and Humanities, Jerusalem.